

April 1982

The independent magazine for the independent user

sinclair user

Only
60p

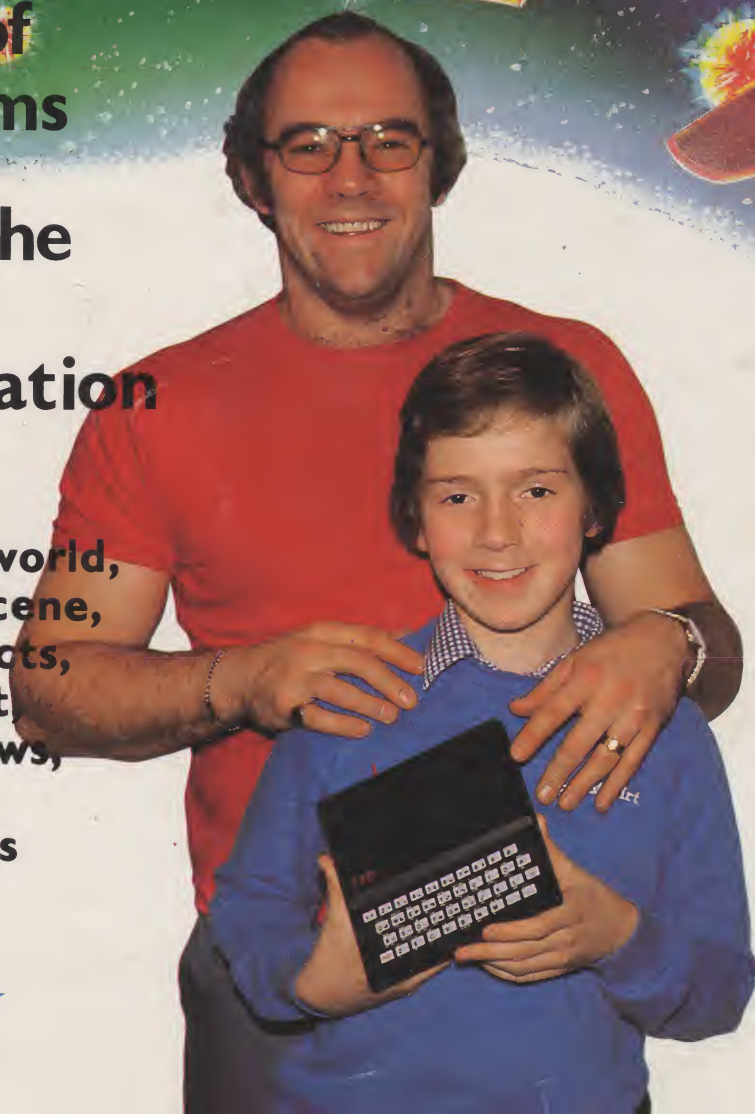
Issue
No 1

Pages and
pages of
programs

Inside the
Sinclair
organisation

Plus:
hardware world,
software scene,
new products,
school spots,
book reviews,
helpline,
mind games

Win a
printer



BUG - BYTE

ZX81 software

ADVENTURES

The Damsel & the Beast	£6.50
Dictator	£9.00
House of Gnomes	£7.00
Startrek	£5.00

UTILITIES

ZXAS Assembler	£5.00
ZXDB Disassembler/Debugger	£6.50
RENUM renumbering program	£4.00

GAMES PACKS

Program Pack 1 (1K)	£3.50
Program Pack 2	£3.50
Program Pack 3 (1K)	£4.50
Program Pack 4	£4.50
Program Pack 5	£4.50
Program Pack 6	£4.50
Program Pack 7	£5.00

EDUCATIONAL

Videograph	£7.50
Tables teaching & testing	£6.00

OTHERS

Constellation	£8.00
Whist	£4.00
Multifile	£17.50
Invaders	£4.00
1K Breakout	£4.50
Viewtext (information display)	£7.00

All programs require RAM pack unless otherwise stated.

BUG-BYTE
Microcomputer Software
98-100 THE ALBANY
OLD HALL STREET
LIVERPOOL L3 9EP

All prices include V.A.T. and postage.

Generous discounts available for dealers.



ACCESS/BARCLAYCARD ORDERS ACCEPTED
ON 24-HOUR SERVICE ON 051 227 2642



PLEASE SUPPLY: _____

NAME: _____

ADDRESS: _____

I ENCLOSE A CHEQUE/P.O. FOR: _____

OR, PLEASE DEBIT MY ACCESS/BARCLAYCARD NUMBER: _____

SIGNATURE: _____

TO SUBSCRIBE
TURN TO
PAGE 25

sinclair user



Editorial director
John Sterlicchi

Consultant editor
Mike Johnston

Production editor
Harold Mayes

Design
Bill Scolding

Advertisement director
Simon Horgan

Advertisement manager
Les Morton

Editorial/production assistant
Sue Hawes

Managing director
Terry Cartwright

Chairman
Richard Hease

Sinclair User is published monthly by ECC Publications Ltd. It is not in anyway connected with Sinclair Research Ltd.

Telephone
All departments
01-359 7481

If you would like to contribute to Sinclair User, please send typed (or beautifully-handwritten) articles or programs to—
Sinclair User
ECC Publications,
30-31 Islington Green,
London N1 8BJ

We will pay £10 for each program printed and £50 for each article which should be approximately 1,000 words long.

© Copyright 1982
Sinclair User
ISSN No. 0262-5458

Printed and typeset by
Bournehall Press Ltd,
Welwyn Garden City,
Herts.



Page 31



Page 44

3 SINCLAIRVOYANCE The question every user asks is "What will Clive Sinclair do next?" Each month we will look into our crystal ball.

7 SOFTWARE SCENE Hopefully all new software which comes on to the market will come under our scrutiny and will form the basis of a series of snappy reviews.

11 HARDWARE WORLD The same applies to hardware. This month we look at various boards, systems, kits and assorted goodies.

14 INSIDE SINCLAIR Meet Ruth Bramley, who works for Sinclair answering the hundreds of technical queries the company receives from users.

17 MICROFAIR MANIA Once again thousands queued for hours to go to the ZX Microfair. Our photographer captured the happy scenes.

18 STARTING FROM SCRATCH Just bought a ZX-81? Well, here is a guide to help you take those tentative first steps to understanding your system.

22 HELPLINE Is this what you have been waiting for? Our expert, Andrew Hewson, aims to answer problems in his monthly column.

27 SCHOOL SPOT Sinclairs have made such a great impact in our schools that we intend to travel the length and breadth of the U.K. looking for interesting applications.

31 EIGHT PAGES OF PROGRAMS Othello, Blackjack and Star Swerver are just three of the programs we list this month. Remember if you have written a program we will pay if we print it.

40 BUSINESS Who said the ZX-81 was no good for business applications? Certainly not Mike Salem, who sets out to prove it is just fine.

43 CONVERSION No, not just to the Gospel according to Clive! This is one for you folks who climbed aboard the ZX-80 bandwagon and want to convert your programs to the ZX-81.

48 BOOKS Almost as much has been written about the ZX-81 as the rest of the micro scene put together. In each issue we will examine a few offerings.

51 SOFTWARE OVERVIEW As this is the first issue we thought we would skate over some of the products which have been on the market a time before we begin more in depth analyses.

56 HARDWARE OVERVIEW Ditto on the hardware side. Stephen Adams scans the market before getting down to dissecting Sinclair's 16K RAM next month.

59 COMPETITION We know that Sinclair printers are supposed to be as rare as gold-dust but we have managed to get our hands on five to give away as prizes.

61 PRESTEL There is £1,000 at stake for the inventor of the best ZX-81/Prestel adaptor. Roger Green looks at what doors such an adaptor would open.

65 MIND GAMES Last but not least we have asked Philip Joy to write a regular column on more thought-provoking games. He, in turn, is asking for help from you the reader.



Programme Control of multiple input/output tapes plus serial printer. Business Systems, Word Processing and Information Retrieval are now fast, easy to programme and save time.

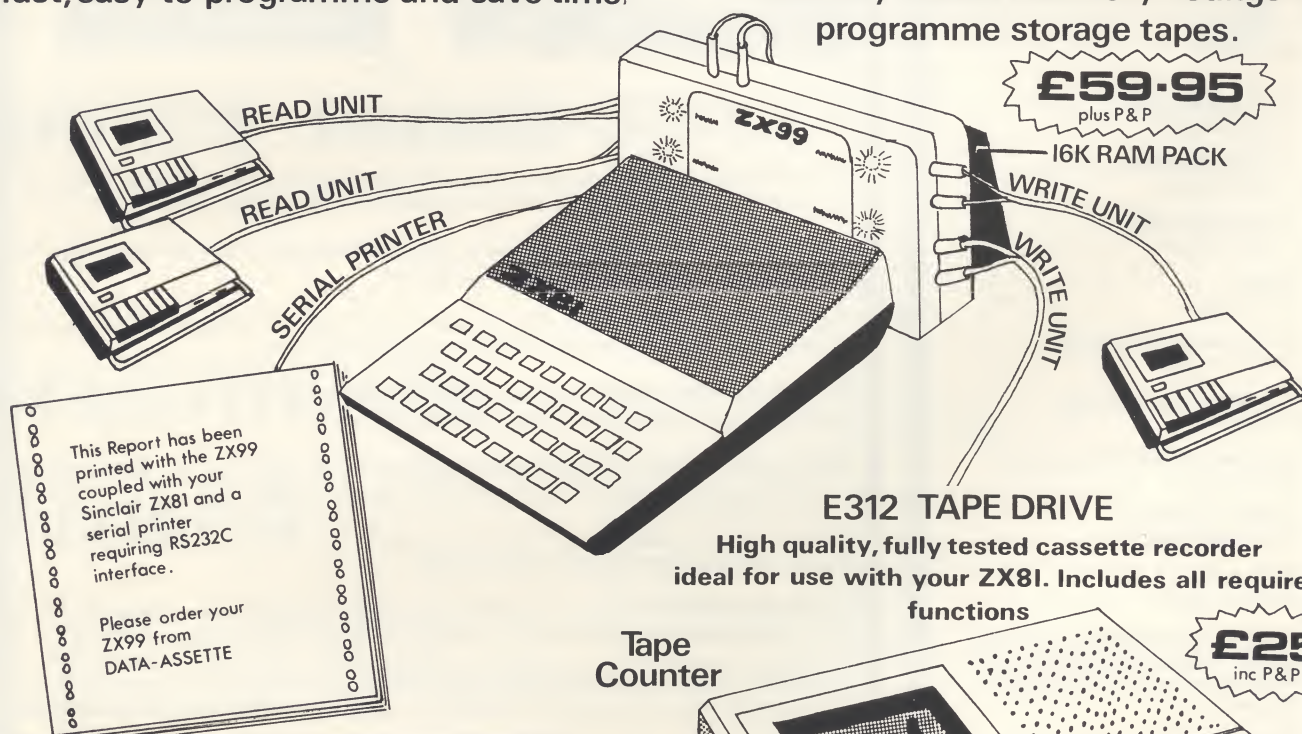
Cassette Users: Everything you need for enhancing your Sinclair ZX80/81

TRADE ENQUIRIES welcome from any country!

ZX99+ AUTOMATIC TAPE DRIVE CONTROLLER

+ SUPER SOFTWARE

- ★ Programme Control for 1 to 4 cassette recorders
- ★ Interface directly to any serial printer (RS232C)
- ★ Single USR command tape to tape copy
- ★ Auto-matically create directory listings of programme storage tapes.



E312 TAPE DRIVE

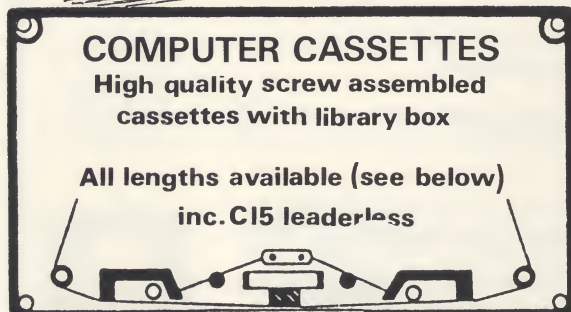
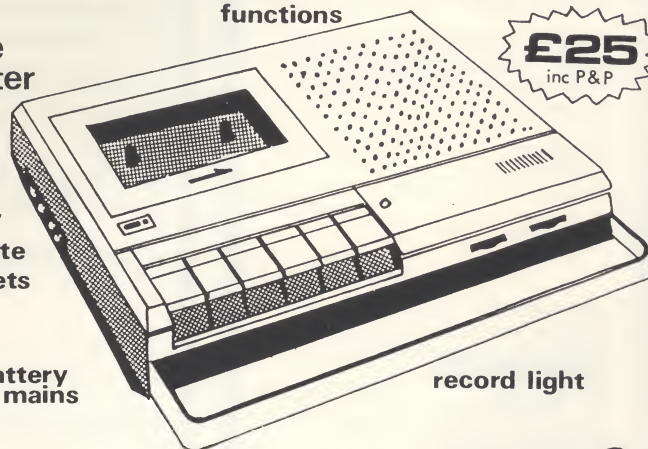
High quality, fully tested cassette recorder ideal for use with your ZX81. Includes all required functions

Tape Counter

Ear Aux Mic/Remote sockets

battery mains

record light



COMPUTER CASSETTES	QTY	PRICE	TOTAL
C5		35p	
C10		37p	
C12		38p	
C15		39p	
C20		41p	
C25		43p	
C30		44p	
C15 Leaderless		£1.00	

Add min £1.50 or 10% P & P

ITEM	QTY	Price inc P & P	TOTAL
ZX99 Automatic Tape Controller + Super Software		£62.90	
E312 Cassette Tape Drive		£25.00	

Cheque/PO payable to Storkrose Ltd.



or Charge my Access/Visa card no:

SIGNED _____

ORDER FORM TO:
DATA-ASSETTE, Dept. SU1, 44 Shroton Street,
London NW1 6UG Tel: 01-723 0141

Telephone enquiries welcome

NAME _____

ADDRESS _____

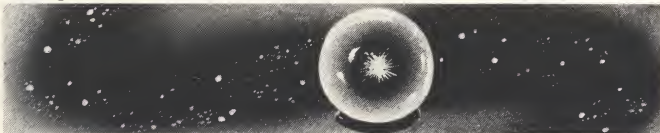


Let's begin with a look ahead

WELCOME to the first issue of *Sinclair User*, the independent magazine which aims to help you make the most of your machine. Each month we plan to provide you with as much fun and information as possible. We will always print a good selection of programs, plus news of new products and in-depth reviews of established hardware and software.

There will also be general interest features and applications stories about how other people are involved with Sinclair and ZX machines.

On this page every month we intend to give you an insight into the future.



To begin, let us imagine a Sinclair computer with built-in screen, colour, discs and extended Basic to rival the BBC computer at around £200. Or even a cheap disc system and a Prestel adaptor for the ZX-81.

Rumours abound but the one man who could answer most of those possibilities for certain, Clive Sinclair, is content for the moment to keep us guessing.

First, the Prestel adaptor, which could breathe new life into the flagging British Telecom system, if the 200,000 or so ZX owners around could be persuaded to buy one. BT is reported reliably to be considering at least 20 applications for its £1,000 prize announced three months ago for a workable ZX-81 adaptor. The winner or winners of the competition are expected to be announced in late April. [See page 61 for the full story].

The adaptor makes exciting news for Sinclair users because it would mean they could communicate directly with each other—directly via Prestel, that is. I shudder to think what that could mean in terms of software piracy.

Commercial suppliers may find they need to sell only one program to see it instantly distributed—free—throughout the country.

Rumours of a mass storage device, possibly for the ZX-81, to be produced by Sinclair Research have been circulating for some time. Surely it cannot be a coincidence that he has a research laboratory near to that of IBM at Winchester.

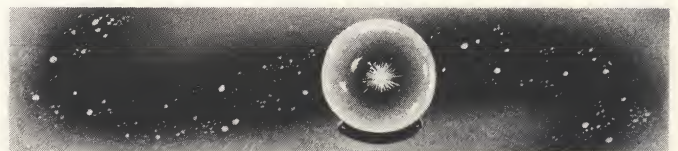
The main rumour is that Sinclair is developing a mini-disc, selling for around £100, and that the development can be expected towards the end of this year and may even be announced shortly. Sinclair said something about discs—across a crowded room—in January. The only problem is that Sinclair seems to

have a shopping list of products which he would dearly like to make—provided that the technology is available to enable him to do so at the proper price and we do not know how far up that list ZX-81 discs are.

Again, it would be marvellous news for ZX users. It is just that it seems too good to be true. Imagine, no more slaving over a hot and possibly unreliable tape recorder, or going to make a cup of tea while the 16K program loads-up. You could make use of that huge address/telephone/stamp collection program you wrote because you could probably access the information in a few seconds, instead of the many minutes it takes at present.

Finally, there is the vexed question of the ZX-82. Will he or will he not produce it? My guess, for what it is worth, is that he will not, at least not in 1982, although I would be delighted, in that case, to be proved wrong.

Speculation about the ZX-81 began almost as soon as the ZX-81 appeared and it seemed that the 80 in ZX-80 referred not to the Z-80 processor it used, as everyone had assumed, but to the year of its launch. A ZX-80 in 1980, a ZX-81 in 1981. What could be more helpful than a ZX-82?



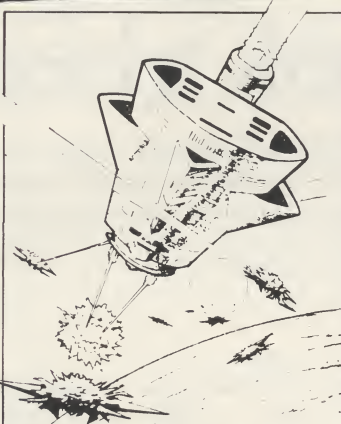
Speculation was fuelled further by Clive Sinclair's reaction to the BBC choice of microcomputer last year. He is reported to have said he could have met the specification for around half the price of the model chosen. Sinclair seemed, perhaps understandably, annoyed that the BBC had failed to select the most obvious choice for a beginner's machine, the ZX-81. The question arose as to whether he would meet the challenge and produce a competing product.

Sinclair said last year that he foresaw a convergence of his computer and flat-screen technologies in 1982. More recently he suggested that it would be a later development—"perhaps 1983-84". He may, of course, have been referring to the negotiations with ICL to produce a small computer terminal incorporating the flat screen and using Sinclair Basic.

What now seems certain, especially in view of his recent licensing agreement with Timex in North America and his tie-up with ICL is that he will stay in the computer field. That being the case, there is a tantalising gap in the market between the ZX-81 and the next product up. If you wanted to upgrade where would you go?



ZX-81

**QS DEFENDER.**

UP - DOWN - THRUST - FIRE
First and only full screen display.
Software to drive QS SOUND BD.
Moving Planetary surface. Up to
84 fast moving characters on
screen at once. On screen scoring.
Ten missiles at once. Increasing
attack patterns. Requires 8K
ROM, and 4K min of RAM. **£5.50.**

QS SOUND BD.

A programmable sound effects
board using the AY-3-8910. 3
TONES; 1 NOISE; ENVELOPE
SHAPER: + TWO 8 BIT I/O PORTS.
Easily programmable from
BASIC, the AY chip does most of
the work leaving your computer
free for other things. Signal O/P
via 3.5 mm Jack socket Ports O/P
via a 16 pin I.C. Socket. **£26.00.**

QS CHRS BD./

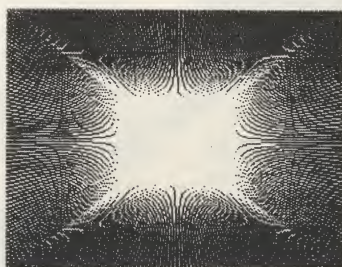
A programmable character
generator giving - 128 SEP-
ARATELY PROGRAMMABLE
CHARACTERS. ON/OFF SWITCH.
1K ON BOARD RAM. Enables
creation and display of your own
characters to screen or printer.
Demo cassette of fast machine
code operation routines and lower
case alphabet included. See below
for ZX PRINTER listing. **£26.00.**

QS - LOWER CASE

abcdefghijklmnopqrstuvwxyz

**QS INVADERS.**

LEFT - RIGHT - FIRE
13x7 INVADERS; High score; 3
levels of play; RND saucers; Bonus
base; Drives Sound bd. & CHRS bd.
Requires 7K RAM, 8K ROM + Slow.
£5.50.

**QS HI-RES BD.**

A Hi-res graphics board giving -
256 x 192 PIXELS. 6K ON BD.
RAM. SOFTWARE SELECT/
DESELECT. MIXED TEXT AND
GRAPHICS. 2K ON BOARD ROM.
Resident fast machine code
graphics software (in ROM)
provides the following HI-RES
Commands. - MOVE x, y; PLOT x,
y; DRAW x, y; BOX x, y; UP; DOWN;
LEFT; RIGHT; PRINT A\$; SCROLL;
BLACK; WHITE CLEAR COPY. See
side for ZX PRINTER listings
using COPY. **£85.00.**

ZX-80

**QS ASTEROIDS**

LEFT - RIGHT - THRUST - FIRE
Software to drive QS SOUND BD.
Multiple missiles firing in 8
directions. On screen scoring.
Increasing number of asteroids.
Full mobility of ship to all areas of
the screen. Two asteroid sizes.
Bonus ship at 10,000 points.
Requires 8K ROM, 4K min of RAM
+ SLOW function. **£5.50.**

QS 3K RAM Bd.

An extremely reliable static RAM
Bd. which combines with the
computer's memory to give 4K
total. Plugs direct in to the rear
port on your ZX Computer.
£15.00.

QS MOTHER BOARD BD. & QS CONNECTOR.

A reliable expansion system
allowing a total of any RAM pack
plus two other plug in boards to be
in use at once. On board 5V
regulator drives all external
boards. Fitted with two 23 way
double sided edge connectors.
Connector is 2x23 way edge
conns soldered back to back.
Expansion can operate in two
ways - (1) COMPUTER ↔
CONNECTOR ↔ Any QS add on bd.
(but no extra RAM pack). (2)
COMPUTER ↔ CONNECTOR ↔
MOTHER BD ↔ ANY RAM PACK.
(2 bds to fit in mother bd.) Mother
board **£12.00** Connector **£4.00.**

Special offers & news

(1) QS Mother bd. + connector + CHRS bd. + The special Graphics version of
ARCTIC COMPUTING'S ZX CHESS 11. £45.00.
The strongest chess program with 7 levels of play.

(2) QS MOTHER BD + CONNECTOR + either SOUND or CHRS bd. **£40.00.**

We will be at the following shows ... Come and see us ...

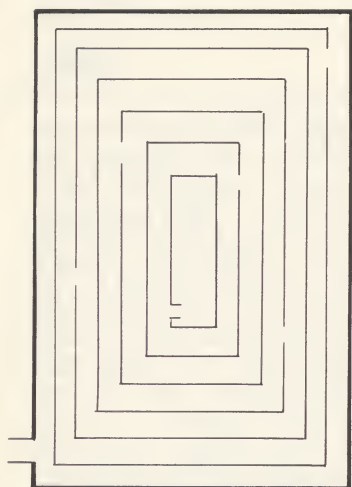
THE COMPUTER FAIR, Earls Court, 23rd to 25th April
3rd ZX MICROFAIR, Central Hall, Westminster.
30th April & 1st May



ALL PRODUCTS FULLY GUARANTEED.

QUICKSILVA: 95, UPPER BROWNHILL RD. : MAYBUSH : SOTON : HANTS : ENGLAND.

Please state Type of machine, Which ROM, Memory size, when ordering.



Entering the 3D Labyrinth

THIS GAME is in full 3D and presents you with an ever-changing view of a corridor along which you must travel to get out of the maze. Written in machine code, it gives a quick reaction to the input of a direction and gives help if you are lost.

The maze changes with every new game and an overall view of it is given for a short time before asking for the input of the first move. The maze size can be selected beforehand to give varying levels of difficulty.

The program costs £5.95 and will fit in 14K, so the 16K pack will be required to use it. Axis, 71 Brookfield Avenue, Loughborough, Leics LE11 3LN markets the program.

Possible replacement for Basic?

A NEW language designed to replace Basic for writing programs. It is designed to simplify the writing of word games, multiple-choice tests and quizzes. It is also recommended for writing computer-aided learning packages for

Each month Sinclair User aims to introduce new products

What's new in the marketplace

schools and colleges. The original Mickie was developed by the late Dr Christopher Evans at the National Physical Laboratory and the NPL still considers it important enough to reserve it as a trademark.

The Mickie language also has single-key commands and is written in machine code for a fast response. A manual of examples is provided with the language. The cost is £15 approximately for manual, machine code language tape, and examples tape.

Mickie for the ZX-81 can be obtained from Abies Informatics, 10 Barley Mow Passage, London W4 4PH.

Glorious games all in 1K

ALL THE programs on the two cassettes will run on the basic 1K ZX-81 without the need for extra memory. The first tape costs only £4 and contains four games—*Laser Blast*, *Alien Crawler*, *Ghost Hunt* and *Torpedo*.

It also contains four programs to help your finances balance. *Bank Budget* will keep a running bank statement for you on your regular payments and check your ZX-81 against the bank's IBM statement

for any computer errors. *Budget* will tell you how much you are worth after you deduct your regular payments. Can you afford that new car? *Car Log* is two programs, one for the dreaded metric litres and one for imperial gallons.

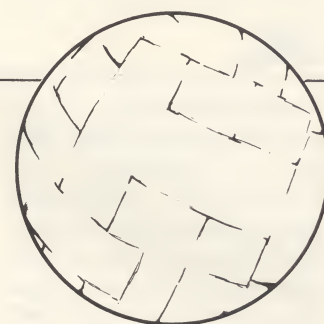
If you want only the finance programs, pay £2.50 for cassette number two. A copy of either tape is available from Zedex, 2 Stone Castle Cottages, Maidstone Road, Five Oak Green, Kent TN12 6SD.

Monopoly makes its mark

BRAND NEW on the market is ZX-81 *Monopoly*. Up to six players can compete and the ZX-81 functions as board, rule book, umpire, dice-thrower, accountant and rent collector. Players are guided through the game by a menu indicating who goes with an update on assets.

As the game is likely to become a marathon a SAVE routine is included. To save a game the QUIT option is used as an interrupt and is followed by a winner so far report. The game can then be saved on tape for future use.

Monopoly costs £8 including VAT and postage and is available from Work Force, 140 Wilsden Avenue, Luton, Beds.



Putting the ball in the net

A MODERN, up-to-date game with four divisions, promotion and relegation struggles and several levels of play. After selecting your team and transferring the players you do not like or cannot afford, see what your game results are. You can play as many seasons as you like, but watch for those injuries.

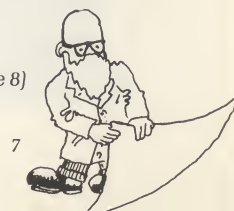
You can save any game on to cassette and continue when you next have spare time. A managerial rating will tell you how good or bad you are. The program obviously requires 16K of RAM and is available for both the ZX-80 and the ZX-81. The ZX-80, however, must be equipped with an 8K ROM.

The cost is £9.95 from Addictive Games, 267B Conniburrow Boulevard, Milton Keynes MK14 7AF.

Helps stop re-inventing the wheel

THIS PROGRAM is for the programmer who spends most of his time re-inventing the wheel in his programs. It provides routines which can be included in most programs and routines which will save

(continued on page 8)





(continued from page 7)

the programmer work. The list includes a RENUMBER which will also change GOTOs and GOSUBs, LOADING SAVE-ing and RUNning machine code, INSPECT-COPY and alter—when COPYd into RAM—ZX-81 ROM routines, REPLACE all lines of Basic in a given program with another.

The cost of the toolkit is £6.50. The author has also written a book on hints and tips for the ZX-81 which has been much praised; it includes more routines for data files.

The book and the toolkit can be obtained from Hewson Consultants, 7 Grahame Close, Blewbury, Oxon OX11 9QE.

Looking through a window

A FASCINATING new language, christened Window Language by its author, is for writing large display programs for shop windows, the like of which has never been seen previously. The screen can be divided into sections, which can be scrolled independently up or to the right, in large or small characters. It can also reverse video any chosen window without affecting the rest of the message. The rolling, changing display can be long, as it requires the 16K RAM pack to run it.

The program is obtainable from Campbell Systems, 15 Rous Road, Buckhurst Hill, Essex IG9 6BL for £7 but overseas orders should include sufficient for an air mail package.



Cheap but also very cheerful

THIS FIRM provides some of the cheapest software listing available, ranging from 55-70 pence. They are all 1K games and include *Alien Chase* and *Nava-rone*—shooting games. *Phototon* fire scores hits as space ships cross your star field view of the universe. *Fireman's Rescue* is a game in which you bounce people from a fire into a waiting ambulance. *Asteroid Belt* means that you must avoid the rocks hurtling at you to survive. There are also some 16K pack games available on cassette from £2 to £4.

Heltaskelta Software is at 48 Cranfield Road, London SE4 1UG.

Machine code monitor

THE PROGRAM allows you to write machine code, SAVE and LOAD it at double speed. It provides breakpoints in your routines, so that you can find the results so far as a check as to why your program crashes. The monitor takes

up 3½K of space on a 16K RAM pack. The 32-page manual with the cassette will show you how to ENTER, RUN and DEBUG your machine code routines independent of Basic.

The Screen Kit 1 by the same firm allows you to create and load data files from cassette from within a program. That can be very useful as it can swap the Basic variables for the same program. A new SCROLL is included which will move the screen, up, down, right or left.

The ZX-MC with manual costs £6.50 and the Screen Kit 1 £4.95.

Both cassettes are available from Picturesque, 6 Corkscrew Hill, West Wickham, Kent BR4 9BB.



Making layouts simpler

SIMPLIFIES the drawing of program layouts for games or teaching programs. It is menu-driven, which means that you have a multiple-choice question to answer for the things you want to do. The characters are inserted on the screen by moving a cursor to the place on the screen where you want the graphic and pressing key 9.

That then draws a line which will follow the cursor until key 0 is pressed. That puts the cursor back into the rub-out mode.

Text and graphics can be inserted anywhere on the screen and up to 12 screens full can be stored in one 16K RAM pack.

The entire program, including all the screens, can be saved on cassette for running later. The cost is £6.95 for the cassette and manual, £8.95 for boxed de-luxe sets.

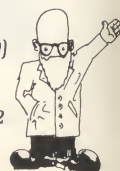
Video Sketch is available from Video Software, Stone Lane, Kinver, Stourbridge, W. Midlands DY7 6EQ.

Aids you on your adventure

GAMEL is not an adventure program but a program which allows you to write your adventure programs. The game is on cassette with an instruction book explaining how you can write programs in hours rather than weeks. The ZX-81 can now be programmed to find a gold treasure within a pyramid, avoiding the long-lost ghosts of his servants and the built-in traps which you have devised. Or, if you fancy discovering minerals on an alien planet infested with monsters and rivals, for rubium, obniberite or titanium, the choice is yours.

Gamel 81 is available from Control Technology, 39 Gloucester Road, Gee Cross, Hyde, Cheshire SK14 5JG.

(continued on page 9)





(continued from page 8)

Speedy game of Defender

ENTIRELY in machine code and providing a very fast game if you can survive. The background moves from right to left, giving the impression of movement over varying terrain. The object of the flight of your defender spaceship is to destroy the invaders from the right. They can fire at you, drop bombs on you or crash into you. All you have to defend yourself is your laser cannon, manoeuvrability up and down and the speed at which you attack the enemy.



Adjustments can be made to the program if your television set cannot keep up with such a fast game as is included in the instructions. If you have bought a sound board from the same company, you can enjoy all rushes of the wind, explosions and crashes, as they are already included in the the program.

Defender is available from Quicksilver, 95 Upper

Brownhill Road, Maybush, Southampton.

Chess on several levels

AVAILABLE in two versions. The original, with levels 1-6 which uses standard notation for moves, presents illegal move if any other is entered and allows you to play black or white. The full screen is used and the machine code games give a very fast response.

ZXchess II has seven levels, one of which, *Lightning chess*, will respond faster in end moves and opening book

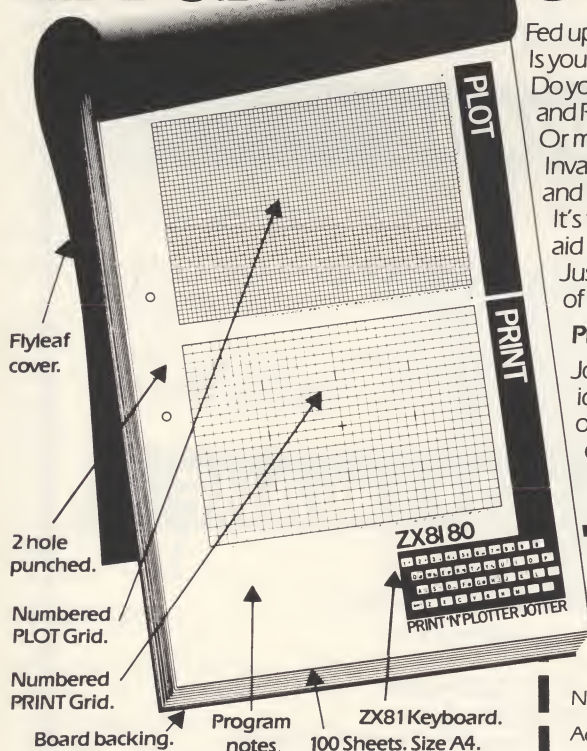
moves. The game, however, can recommend your best move and recognise stalemate.

Both games will allow you to set up your own board pieces and start from there, thus allowing you to solve newspaper problems without waiting a week for the results. ZXchess II also allows you to copy the board on to a Sinclair printer or to store a game on to cassette.

Artic Computing, author of ZXchess, can be reached at 396 James Reckitt Avenue, Hull, North Humberside. ZXchess is £8 and ZXchess II £14.

All prices in this review have been rounded-up to include VAT and postage where possible.

HOW TO GET SERIOUS ABOUT ZX GRAPHICS FOR ONLY £3.50



Also available 'over the counter' at Denny's Booksellers, 2 Carthusian St., London EC1. Buffer Micro Shop 374a Streatham High Rd. London SW16.

Fed up with listings that ignore the graphic approach? Is your PRINTING and PLOTTING still guesswork? Do you want to write data programs with graphic PRINT AT and PLOT and professional looking 'windows' and 'scrolls'? Or maybe you're still trying to find the successor to Space Invaders! All you need is ingenuity... and the **PRINT'N'PLOTTER JOTTER**.

It's the professionally-produced ZX Graphics-aid designed by enthusiasts....for enthusiasts. Just take a look at the specification - then think of the possibilities for **real** graphic graphics!

PRINT'N'PLOTTER FILM TOO - FOR ONLY £2.25!

Jotter 'FILM' is a matt Polyester film version of the "JOTTER" Grids identical in size so you can co-ordinate **precisely** PRINT and PLOT or you can copy photographs, drawings, maps, charts! The surface of the film is ideal for drawing (with pencil) and erasure.

With both JOTTER and FILM the graphics possibilities are enormous - despite low resolution. Isn't it time you got serious about ZX Graphics?

Post to Butler, Currie & Hook, 19 Borough High Street, London SE1 9SE.

Please send me "Jotters" @ £3.50 (inc VAT, P&P)

Please send me "Films" @ £2.25 (inc VAT, P&P)

Please send me your illustrated leaflet - I enclose a stamp.

Please bill my Access/Barclaycard No: _____

Name _____

Address _____

Post Code _____

All goods are despatched within 48 hours of receipt. If you require 1st Class return post please add 50p to "Jotter" price.



ZX 80/81 HARDWARE/SOFTWARE

ZX KEYBOARD

Now with repeat key facilities to add a numeric pad. The keyboard has all the 80/81 functions on the keys, and will greatly increase your programming speed. It is fitted with push type keys as in larger computers.

The keyboard has been specially designed for the Sinclair computer and is supplied ready-built. It also has facilities for 4 extra buttons which could be used for on/off switch, reset, etc. **£27.95.** Numeric Pad **£10.00.**



4K GRAPHICS ROM

The dK Graphic module is our latest ZX81 accessory. This module, unlike most other accessories fits neatly inside your computer under the keyboard. The module comes ready built, fully tested and complete with a 4K graphic ROM. This will give you 448 extra pre-programmed graphics, your normal graphic set contains 64. This means that you now have 512 graphics and with there inverse 1024. This now turns the 81 into a very powerful computer, with a graphic set rarely found on larger more expensive machines. In the ROM are lower case letters, bombs, bullets, rockets, tanks, a complete set of invaders graphics and that only accounts for about 50 of them, there are still about 400 left (that may give you an idea as to the scope of the new ROM). However, the module does not finish there; it also has a spare holder on the board which will accept a further 4K of ROM/RAM. This can be used with a 1K or 2K RAM chip for user definable graphics, so you can create your own custom character sets. **£29.95.**

MEMORY 80/81

16K RAM

Massive add-on memory for 80/81. **£32.95.**

2K & 4K RAM

Static Ram memory expansion for the 80/81. They both work with onboard Ram i.e. 4K plus onboard= 5K. This is the cheapest small memory expansion available anywhere. 2K RAM **£14.95.** 4K RAM **£19.95.**

16K 81 SOFTWARE

DEFLEX. This totally new and very addictive game, which was highly acclaimed at the Microfair, uses fast moving graphics to provide a challenge requiring not only quick reaction, but also clever thinking. One and two player versions on same cassette. **£3.95.**

3D/3D LABYRINTH. You have all seen 3D Labyrinth games, but this goes one stage beyond; you must manoeuvre within a cubic maze and contend with corridors which may go left/right/up/down. Full size 3D graphical representation. **£3.95.**

CENTIPEDE. This is the first implementation of the popular arcade game on any micro anywhere. Never mind your invaders, etc., this is positively shining, the speed at which this runs makes ZX invaders look like a game of simple snap. **£4.95.**

16K GRAPHIC ROM SOFTWARE

CENTIPEDE Graphic ROM version of our popular centipede game.

SPACE INVADERS. The only real version of space invaders on the ZX computer.

Please add £1 p&p for all hardware, Software p&p free. Specify ZX80/81 on order.

ALL OUR PRODUCTS ARE COVERED BY A MONEY BACK GUARANTEE.

dK'tronics

23 Sussex Road, Gorleston,
Great Yarmouth, Norfolk.
Telephone: Yarmouth (0493) 602453

SU

Add-ons to make your computing more fun

As more and more people buy ZX-81s, more and more companies are bringing out add-on products. Each month we will look briefly at what has arrived recently on the market

Slow mode kit

NOW a kit for a ZX-80 which will allow you to have a constant static screen when used with the 8K ROM. Compshop will not assemble kits or attach them to a ZX-80. The kit is for the ZX-80 enthusiast who can use a soldering iron, as it takes care and patience to fit it inside the ZX-80 case.

It stops that annoying flicker when accepting an INPUT or entering a program from the keyboard. The top line will tend to slant to the left and the power supply may have to be changed, as the unit draws 300ma from the +5V regulator but the cost is only £15.99.

Compshop Ltd, 14 Station Road, New Barnet, Hertfordshire EN5 1QW. There are Compshops in the U.S. and the Republic of Ireland.

Aiming for real power

DATA-ASSETTE has launched the first of its hardware add-ons for the ZX-81. Called the ZX-99, the device slots into the

expansion board and according to the company gives the ZX-81 real computing power.

Four tape recorders can be handled at one time and business applications are now within reach.

The ZX-99 also provides an RS232C serial output interface which allows a wide range of printers to be driven.

The ZX-99 is available from Data-assette, 44 Shroton Street, London NW1.

Boards galore from Quicksilva

THIS COMPANY was one of the first to introduce a motherboard, so that other things could be connected

from 3K RAM packs at £18 to sound and programmable graphics boards. All the boards, apart from the RAM, will plug in either direct to the ZX-81 via a QS connector—a double-sided edge connector—or into the motherboard.

The sound board also has included a 16-bit port which can be used to control devices external to the ZX-81 by PEEK and POKE commands. The boards are all supplied with very clear, easy-to-understand instructions and Quicksilva provides test programs for each unit.

QS motherboard £12; QS sound board £26; QS CHRS board £26; QS RAM from £18-£35. Quicksilva is at 95 Upper Brownhill Road, Maybush, Southampton, Hampshire.

Making the proper noises

THIS UNIT will allow ZX-80 or ZX-81 owners to put any audio sounds through their TV loudspeakers. The sounds can be fed-in from a tape recorder—instructions for using the program perhaps? They can also be used to give *Space Invaders* real explosions.

The kit requires the use of a soldering iron to attach

it to the ZX-81 video modulator but derives all its power from the internal +5V regulator. The kit is a metal box which fits on top of the modulator inside the ZX machines. A separate audio lead which can be plugged into a tape recorder ear socket or the output of a sound board is also provided. The audio transferred in the slow mode is unaffected by the ZX-81 computing.

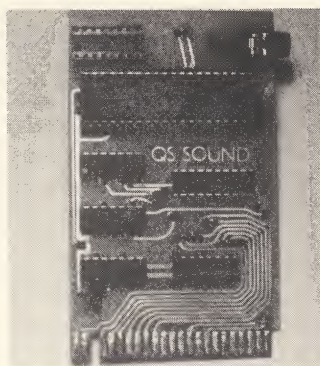
The audio modulator costs £10 and is available for Compusound (U.K.), 32 Langley Close, Redditch, Worcs B98 0ET. It is called a Telesound 82.

Keying out of industry

THIS PROFESSIONAL keyboard is from a manufacturer of keyboards for the computer industry generally. It consists of 46 microswitch keys with the correct stepped arrangement for a QWERTY keyboard. It requires no soldering to attach it to the ZX-81—only the opening of the ZX-81 plastic case and the insertion of the replacement leads.

It is complete with instructions. Forty keys are labelled with the Sinclair codes, leaving six spare keys for the user and the space bar unmarked. The overall dimensions are 10in. x 4½in. x 2in.

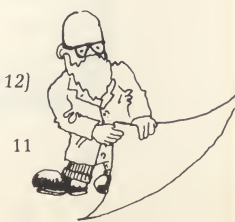
The cost is £28.95 for the keyboard and £43.95 for the keyboard in a metal case. Computer Keyboards is at Glendale Park, Frenbank Road, Ascot, Berkshire.



Part of the range.

to the ZX-80 or ZX-81 when the 16K or other memory pack was fitted. Since then, a range of goods has been produced,

(continued on page 12)





(continued from page 11)

Taping-out your problems

THIS tape recorder has been designed by a manufacturer of floppy discs to eliminate the problems with LOADING and SAVING tapes. Each tape recorder, which looks the same as any portable tape recorder, is tested and sold complete with a certification tape. The ECR81 has a long-life recording head adjusted for the correct alignment to TDK CrO2 high bias tapes.

It takes the data from a tape and passes it through a special circuit, so that tape variations cannot effect the data LOADED into the ZX-81. The output is through a DIN socket. Program names can be entered for recording on tape through a condenser microphone fitted within the tape recorder.

The ERC81 tape recorder can be obtained from The Monolith Electronics Co Ltd, 5-7 Church Street, Crewkerne, Somerset TA18 7HR.

A port only for the ZX-81

A MEMORY-MAPPED port which can be PEEKed and POKEd from a Basic program located at 11,000 for the ZX-81 or 25,000 on a ZX-80. That means that it cannot be used with the 16K RAM pack on the ZX-80; the 16K RAM can be used only on the ZX-81. That port allows the user access to control printers, to light LEDs, to use joy-

sticks. Technomatic can also supply a booklet of applications for 40 pence if you want some ideas. Demonstrated at the ZX Microfair was the use of the OUTPUT port to generate tones through an external loudspeaker. The INPUT and OUTPUT ports are mounted on a printed circuit board which plugs into the back of the ZX machines, so an extra printed circuit board will have to be used to attach the 16K RAM pack—also obtainable from the same firm.

Technomatic can be contacted at 17, Burnley Road, London NW10 1ED. The port costs £18.

One switch from Abacus

THIS BOX has one switch to control all your tape recorder functions. LOADING and SAVING, cueing the tape up to the correct position and inserting a voice on to the tape all



Controlling your tape.

have one switch position. Cueing is done by listening to the tape via the amplifier and loudspeaker included in the unit. The same loud-

speaker is used for a talk-in before the program starts.

Feedback causing hum or a high-pitched tone on recordings is eliminated by switching-off the ear connection when SAVING. Therefore all the leads can be left plugged-in all the time.

The unit is also supplied with 70 centimetres of cable so that the tape recorder does not have to be sited next to the ZX machine.

Abacus can be contacted at 186 St. Helens Avenue, Swansea, West Glamorgan. The controller costs £12, including postage and packing.

Helping to expand up to 32K

THIS RAM pack fits on to the back of a ZX-81 to give 32KB of memory for use by the Sinclair 8K Basic. The original 16K can be expanded to 32K on the ZX-81 by altering the RAMTOP variable and giving the command NEW. After that is done there is 16K for programs and 16K for variables and data.

Audio Computers now supplies some programs for storing the screen and program in high memory—above RAMTOP. That allows you to change the screen within a program and swap programs stored in RAM. It is not possible with the programs just to swap the variables (data) to a new program.

Audio Computers is at 87 Bournemouth Park Road, Southend-on-Sea, Essex. The 32K RAM pack costs £46 for a kit and £54 ready-built.

Screwing-in a system

THE FULLER DP system consists of a keyboard unit which contains your ZX-80 or ZX-81 printed circuit board and a keyboard made up of 40 microswitches in the same layout as the Sinclair flat keyboard. The tops of the keys are stepped and have on the key-tops the same symbols as the Sinclair keyboard, covered with a clear plastic top to prevent wear.

The system can be built-up using the 16K RAM pack and a motherboard which will accept any boards which will plug into the standard 23 × 2-way edge connectors.

The power supply can be fitted inside the case and can reduce the number of cables required to connect the unit. The system requires only a screwdriver to assemble unless you have ZX-80; if that scares you, Fuller will do it for £10. The basic system, which consists of the cased keyboard, costs £32.75 as a kit or £38.75 built.

Fuller Micro Systems is at Sandfield Park East, Liverpool L12 9HP.

Aiming at 'proper' invaders

IF YOU become disinterested in *Space Invaders* looking as if they were made from Lego, you can, with this board, swap Sinclair letters and charac-

(continued on page 13)





(continued from page 12)

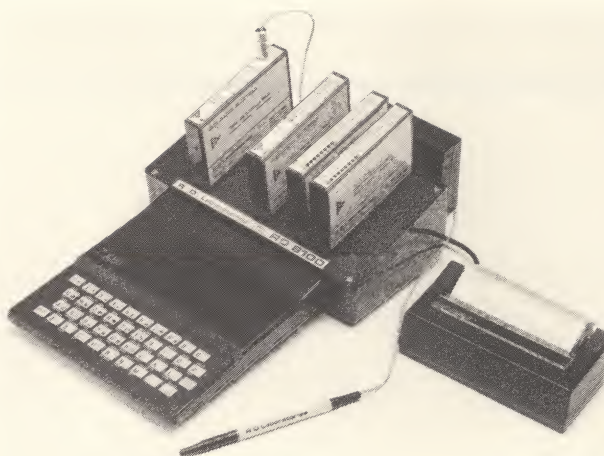
ters for proper *Space Invaders*. It fits beneath the keyboard in the ZX-81 and requires three soldered connections to the ZX-81 printed circuit board. If that worries you, send the ZX-81 and an extra £3 and it will be done for you.

There are 448 extra characters within the ROM which require no special taped program or RAM to use; a simple instruction of LET X=USR (?????) is all that is required. There is a spare socket on the unit so that graphics symbols of your choice can be used. A RAM chip—4118 or 6116—must be inserted in the socket to store all these user-defined characters.

The 4K graphics ROM and printed circuit board is available for £30.95 from dK'tronics, 23 Sussex Road, Gorleston, Gt. Yarmouth, Norfolk.

Mum's the word for facilities

THIS SYSTEM, usable on the ZX-80 or ZX-81, consists of a motherboard into which cassette case-type modules plug, giving extra facilities. The motherboard consists of a connector to plug into the ZX machine and vertical printed circuit boards on to which the modules fit. The printed circuit expansion port at the back connects to the



Plenty of facilities for RD.

16K RAM pack. There are two sizes of motherboard. the Micro-mum which will take two boards and the Super-mum which will take eight boards. The unit is supplied from the ZX machine +9V line via its +5 V regulator. All the devices from light pen to analogue and digital inputs are available through

PEEKing and POKEing location 15360 to 16383. The Mini-mum costs £15.80, the Super-mum £40.80. The modules cost between £23.30 and £33.30.

RD Laboratories is at 5 Kennedy Road, Dane End, Ware, Herts SG12 0LU.

All prices in this review are rounded-up to include VAT at 15 percent and p+p.

ZX80

JRS SOFTWARE

19 WAYSIDE AVENUE, WORTHING, SUSSEX, BN13 3JU
TELEPHONE WORTHING 65891 (Evenings and Weekends only)


ZX81

16K RAM PACK £35 (s69.95)

Fully built, tested and guaranteed
Black case
No 'wobble' problems - fully supported by ZX81
Fully compatible with printer etc, etc.
Full refund if not delighted

(Please allow 14-21 days for delivery)

WHY PAY MORE



An ESSENTIAL addition to your 1K RAM ZX81 (or ZX80 8K ROM)
(please state which when ordering)

TOOLKIT (written by PAUL HOLMES)
Provides the following additional facilities

Line renumber - you state starting number and increment value.
Search and replace - changes every occurrence of a character as you require.
Free space - tells you how many free bytes you have left

SPECIAL GRAPHICS ROUTINES
Hyper graphics mode - graphics never seen on a ZX81 before.
Open - instantly sets up as many empty print lines as you require. (1K version only)
Fill - used in conjunction with OPEN fills your screen instantly with your specified character
Reverse - changes each character on your screen to its inverse video.

TAPE ROUTINE - provides a system WAIT condition until a signal is received in the cassette ear jack - many uses!

All these routines are written in machine code and together take up only 164 BYTES of your precious RAM - an incredible achievement!!

The price is incredible too! ONLY **£4.95 (s7.90)** for cassette, including FULL instructions and example programs.

ALSO available 16K version ONLY **£4.95 (s9.90)** which includes all the above PLUS: GOTO's and GOSUB's included in line renumber.
Search for and list every line containing specified character.

16K VERSION

CASSETTE professionally recorded by SOUND NEWS STUDIOS

GAMES PACK - Beat this for value! 5 x 16K programs PLUS 2 x 1K programs **£4.95 (s9.90)**

3-D Battle (M/code-1K) - Fast-moving space battle with continuous count-down of enemy units left.

City Bomb (M/code-1K) - Destroy the buildings and land your plane. Your fuel has nearly gone and you circle the city lower and lower

Warp Wars (Basic & M/code-16K) - Features realistic space-craft moved by M/code for (previously sold at Microfair with instant response.
Sweet Tooth for £4.95)

Snake (Basic-16K) - A game of thought and skill. Pass through all the marked squares without crossing or doubling back on your path, but watch out for the expanding black blob.
(previously sold at Microfair for £3.95)

Sweet Tooth (Basic & M/code-16K) - M code routines used to move your fat face round the screen and gobble the sweets.

PLUS Slalom and Black Holes (previously sold together for £4.95)

OVERSEAS CUSTOMERS PLEASE NOTE Payment may be made in Sterling (Money Order available at your bank) or \$U.S. (U.S.A. customers only).

ALL GOODS SENT AIRMAIL

ZX81

16K

MACHINE CODE DEBUG/MONITOR

- **ELIMINATE MACHINE CODE PROBLEMS** with ZX-MC - a new software debug/monitor for the ZX81 16K.
- **ENTER, RUN & DEBUG** your machine code programs independently of Basic commands. ZX-MC resides in RAM, and leaves you 12½K of memory to work with.
- **SAVE & LOAD AT DOUBLE SPEED** any specified area of free RAM. At last you are freed from storing your M/C in arrays or REM lines.
- **REGISTERS DISPLAY & BREAKPOINTS** to make de-bugging easier - PLUS many more useful commands.
- **A MUST FOR BEGINNERS & ADVANCED USERS** - concentrate on your M/C programs, not on how and where to store them.
- **ZX-MC** is supplied on a high quality cassette, with a 32 page operating manual, for only

£6.50 fully inclusive (C.W.O.)

SCREEN KIT 1

A suite of machine code routines that are called from Basic programs, to enhance your screen display, and create Data Files on cassette. SCREEN KIT becomes part of your Basic program.

- **DRAW A BORDER**
- **CLEAR PART OF SCREEN**
- **LOAD ANY CHARACTER TO WHOLE SCREEN**
- **CLEAR SCREEN BY SCROLLING UP, DOWN, LEFT OR RIGHT**
- **KEYBOARD SCAN + FLASHING CURSOR**
- **INVERT VIDEO OF PART OF SCREEN**
- **MEMORY LEFT**
- **DATA FILES** - lets you Save & Load, at double speed, just the Basic variables. Different Data Files can now be Loaded into the same Basic program.
- Supplied on cassette with instructions.

£4.95 fully inclusive (C.W.O.)

Send large SAE for more details. Programs available mail order only. Allow up to 14 days delivery. Please make cheques/PO payable to:

PICTURESQUE

6 CORKSCREW HILL, WEST WICKHAM, KENT BR4 9BB

SEE US AT THE ZX MICROFAIR - APRIL 30 and MAY 1

Introducing with more t fair share of



Every day Sinclair receives up to 50 pleas for help. And incredibly they are all dealt

WITH 250,000 ZX-81 sales under the belt of Sinclair Research, the technical advice department is inundated with enquiries every day, covering an ever-wider range of points.

Many people might think that Sinclair employs an entire team of experts to deal with the mounds of technical queries pouring in daily but, in reality, one person copes with them single-handed.

Now housed in the recently-acquired, plush offices of Sinclair Research in Cambridge, Ruth Bramley, with some help from her secretary, deals every day with the sometimes daunting task of replying to technical enquiries about the ZX-80 and ZX-81.

On the surface that part of the Sinclair operation appears a simple one. If you write to the Cambridge headquarters or telephone with a technical enquiry, nine times out of 10 you will be given a prompt, helpful answer.

Behind the scenes, however, it resembles organised chaos. As the only technical adviser for Sinclair, Miss Bramley has to deal with all the letters and telephone calls on the subject. On an average day she handles between 30 and 50 letters and calls.

About a year ago she was receiving something in the region of 20 to 30 letters and calls a week, which shows how much ZX-81 sales have increased in that time.

People of every age like to know about the ZX-81, ranging from

schoolchildren who have just started using the machine to middle-aged people verging on retirement who do not want to let their brains go stale, through to the elderly who find tackling some such new concept an interesting challenge.

"If children write or telephone me, I will take extra trouble to sort out their problems because, after all, they are the adults of tomorrow who will be using this technology all the more", she says.

With such a wide range of people wanting information, it is inevitable that they will make a variety of requests and need many different problems solving.

"The biggest query is undoubtedly from people asking about cassette loading and almost always it is because people are using a recorder which is not compatible", she adds.

To cope with the demand generated by that query, a standard letter has been devised which tells the user how to set the correct signal level, the correct type of jack-plug to use, how to avoid noise from mains being recorded on to the tape, and how to align the tape properly against the playback head.

With the letter is also sent a list of cassette recorders which have proved to be compatible with the ZX-81 and which produce the best results.

The process of answering written enquiries is time-consuming. It starts at the Cambridge King's Parade HQ where the letters arrive. Once opened, a small team of people



Ruth Bramley: up to 50 letters a day.

g the lady e than her of problems

with by one woman, Ruth Bramley. Here we look at how she manages to cope



sort them into various categories. Many require a standard brochure about the computer containing details about both the hardware and applications software available and how to order goods.

Anything of a remotely technical nature goes straight to Miss Bramley. Others are sent to her equivalent in the sales, engineering, production and complaints departments.

"I like to have the letters in and out the same day, otherwise I accumulate an enormous backlog", she explains.

Most of the letters are helping people with programming problems. With programming forming part of her mathematics degree course, together with a spell with a software house, she is unlikely to experience great difficulty.

"Many of the programming enquiries are from people, often children, wanting to know how to deal with data read and store. There are two standard letters we send dealing with cassette loading difficulties, problems experienced with the 16K RAM pack, and hints on how to save and load with the ZX-81.

"If there is anything really specific which requires a separate answer, I will see what needs to be done and send a reply", she says.

If she receives a number of queries about one subject, she considers compiling a new standard letter to solve the problem.

The only queries in her sphere which she sometimes finds difficult

to handle are those connected with engineering. Yet there is no problem there, because she can go to the engineers at any time.

Questions she deals with alone include modification of the ZX-81 and enquiries about the circuit in the machine.

Her secretary deals with the general administration of the small technical enquiries department but the two share an office with five girls comprising the sales and administrative department.

If she is particularly inundated with paperwork and is unable to answer a telephone enquiry, the other girls are capable of dealing with basic technical questions, like saving and loading.

The method of handling enquiries by telephone is just as efficient as dealing with the mounds of mail. Since December she has set up a logging system recording every telephone enquiry with which she deals. For each call she answers she notes the date on which it occurred, the time of day, the caller, and the points the caller makes—in her own code.

Frequently callers telephone again and her log enables her to find quickly and easily what the previous enquiry was about.

At the moment there are no plans to employ another technical expert to lessen the workload but if interest in the ZX-81 continues to grow as much this year as it did last year, it will not be long before the technical advice department expands to keep customers satisfied.

HILDERBAY LTD PROFESSIONAL SOFTWARE

If you don't believe that the Sinclair ZX81 can do real work, come and see us at the Computer Fair Exhibition, Earls Court (23rd-25th April) and the ZX Micro Fair, Central Hall, Westminster, London SW1 (30th April-1st May).

ZX81 & 16K SOFTWARE: Reviewed in "Your Computer" (Feb. 1982).

- ★ **Payroll** for up to 30 employees. Meets all regulations £25.
- ★ **Stock Control** Fast, big, and versatile £25.
- ★ **Budget** £15.
- ★ **Critical Path Analysis** Up to 500 activities £15.
- ★ **VAT & Mortgage & Loan** £8.
- ★ **GOLD:** A really good adventure; together with the intriguing "Pick a Word". £8.
- ★ **RELIABLE 16K RAM Pack** for the ZX81 £42.
- ★ **BEAMSCAN:** Beam analysis for architects and engineers £25.
- ★ **APPLE II Payroll:** £35.
- ★ **HEWLETT PACKARD 9845B:** Superspline (general purpose interpolation and tabulation).
- ★ **MEMOTECH 64K Memopak** £79.

DO YOU HAVE DIFFICULTY LOADING TAPES! We have the answers; and for well under £10.

Contact us for more details.

CROFTON PROFESSIONAL KEYBOARDS, MONITORS, VDU's
Prices include VAT, Post & Packing. COD Orders £2 extra.

TAPE HINT: Don't use the first 20 seconds of your cassettes — most tape problems are found near the ends of the tape.



HILDERBAY LTD (YCM), 8/10 Parkway, Regents Park, London NW1 7AA.

Telephone enquiries for Hilderbay Ltd. will now be handled by HOLDCO LTD.
Tel. 01-251 3090

ZX81 & 16K SOFTWARE

EQUATION PACK : linear and quadratic equations, sets, equations of higher degree. £8.

MATRIX ROUTINES : the matrix statements of normal basic (MAT . . .) £8.

CALCULATOR PACK : the equivalent of RPN calculators. 40 operations and functions. £8.

ELEMENTARY STATPACK : mean, variance, stand.dev., stand.err., covariance, corr. coeff., anal. of variance, lin. regression £10.

METRIC/IMPERIAL/US CONVERSIONS : length, surface, volume, weights and measures, speed £6.

TRIANGLES : complete trigs package £8.

POLYNOMIAL EVALUATION : operations, zero's (int., real, complex) and Descartes £10.

BARCharts FOR ARCHITECTS : a simplified version, takes away the tedious task of manually handling the problem £25.

BANK ACCOUNT : calculate your bank charges whilst keeping your account £5.

HOLDCO GAMES — See our special advertisement in this magazine

Prices include VAT, Post & Packing. COD Orders £2 extra.

HOLDCO LTD.
14, BRITTON STREET
LONDON EC1M 5NQ
Tel: 01-251 3090

Microfair mania



MICROMANIA hit Westminster Central Halls again recently when the second ZX Microfair was held there.

Our photographer has captured the atmosphere of the thronging crowds who had to wait up to four hours before getting into the show.

No wonder show organiser Mike Johnston is looking exhausted but pleased (bottom right) . . . some 7,000 people paid 50p each to fight their way round to the 70 exhibitors.

Mike, who is pictured with his band of helpers, is at the moment planning his next Microfair which, to help avoid the massive queues, is being held over two days on Friday, April 30 and Saturday, May 1.



ZX81ZX81ZX81ZX81ZX81ZX81ZX81ZX81ZX81ZX81ZX81ZX81

B

TEXT TEXT TEXT TEXT TEXT TEXT TEXT TEXT TEXT TEXT TEXT TEXT



1ZX81ZX81ZX81ZX81281Z

your ZX-81; you can buy a cheap portable set for around £50 or obtain a second-hand one even more cheaply. Similarly, it makes life easier if you can find a corner somewhere to leave your equipment permanently set up—unplugged. You will find that you use a few power sockets for your system and a four-way block connector on a short length of extension cable helps to tidy trailing leads.

The ZX-81, like a pocket calculator, 'understands' numbers and signs like plus and minus. It is far more sophisticated, however, than a calculator and can also cope with letters and words—those on the keyboard—provided they are presented in the proper way.

Most manufacturers have their own slightly different version or dialect of Basic and Sinclair is no exception. What this means, in practice, is that a program—a series of instructions to the com-

What to do now you have bought your Sinclair

Don't panic! Here is the Sinclair User beginners' guide

puter—written for one machine will not work on another without some modification but if you understand Sinclair Basic you can soon learn the minor peculiarities of other versions and, with a little practice, adapt them for the ZX-81.

You do not need to wait to learn the language to start. You can copy the programs you find in *Sinclair User*. A word of warning. Make sure you copy them exactly. You may understand a sentence with a comma or a quote omitted but your ZX-81 relies on those cues and the program will not work without them.

For that reason, it is a good idea to SAVE a program on cassette tape before you press RUN and NEWLINE to make it work. That way, if you have made a mistake and you lose the program from the computer, you can LOAD it back quickly from the tape and look for the error, without having to type it in from the beginning.

You can also buy a wide variety of commercially-produced, pre-recorded programs on cassette. They can vary a good deal in quality and you will need to read the reviews and use your judgment to choose the best.

A good deal of the interest and fun of having your own computer is in writing your own programs, which is easily as fascinating as playing even the best game of *Space Invaders* written by some-

one else. The manual deals thoroughly with Sinclair Basic but if you find it heavy going or not to your taste, there are plenty of books available for the ZX-81. Check your local bookshop and find one which suits you.

Many people feel that the best way to learn is to plunge in at the deep end and see what you can make the computer do. Refer to the manual if you have difficulties. You can ignore the functions and calculations initially and experiment with PRINT statements to get the feel of your machine. The beauty of having your own computer is that you can learn at your own pace in the style which suits you best.

Keeping your programs

You lose the program contents of your computer when you turn off the power but you can take a copy of the program, because the ZX-81 can reproduce the instructions you have typed-in as a coded sound signal which you can record on to ordinary cassette tape. When you want to use the program you play it back to the ZX-81 and it translates the coded sound back as your program.

To record a program, you SAVE it and to play it back you LOAD it. Chapter 16 of the manuals tells you in detail how to do it. You may have problems occasionally in LOADing, usually with tapes recorded by other people. One

way to deal with that is to wind the tape to the middle of the program and type LOAD " " followed by NEWLINE, then slowly turn up the volume of the recorder with the tape running until the television screen shows four or five horizontal black bands. If you then re-wind the tape, the program should load normally at the volume setting.

Carry on computing

Finally, a health warning. Apart from any practical uses, computing with your ZX-81 can be a very entertaining hobby and is almost certainly habit-forming. You may easily find yourself crouched over your machine, red-eyed, in the early hours of the morning, thinking that in another five minutes you will sort out the problem. Try to break that habit by getting into the fresh air and meeting other Sinclair users; it undoubtedly will help your programming—and your non-computing friends, poor souls, will probably be sick to death of hearing about computers by that time in any case.

By getting a ZX-81 you will find you have joined a not very exclusive club with many thousands of members, many of whom would be only too happy to advise you if you have problems. *Sinclair User* will help you to get in touch with other users by printing a list of clubs each month.

ASSOCIATION OF LONDON COMPUTER CLUBS

Proudly presents

THE 3rd LONDON COMPUTER FAIR

APRIL 15th 16th & 17th 1982 10am - 6pm
[7pm 16th]

Including: Retail Exhibitors • Hobbyists
Club Stands • Seminars • Workshops
Bring and Buy Sale [17th only]

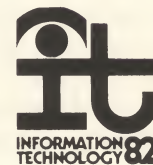
Admission £1.00

POLYTECHNIC OF NORTH LONDON
THEATRE

⊖ Opposite Holloway Rd. tube station ⊖

SPONSORED BY EDUCATIONAL COMPUTING,
COMPUTING TODAY and

The Polytechnic
of North London



ZX81 USERS

From "BYG BYTE" comes a fully
compatible, assembled, tested and
guaranteed

16k RAM PACK

PLUG-IN MEMORY

Send to Name

Address

.....

.....

All cheques and postal orders made payable to
CAPS LTD

And forward to **28 The Spain**
Petersfield, Hampshire GU32 3LA

Allow 28 days for delivery

WHY PAY MORE?

Fully inclusive price each

£34.95



HELLO and welcome to HELPLINE. Each month I shall answer a selection of letters from my postbag on a theme of interest to Sinclair users. Often I shall refer to pages in the manual supplied with the ZX machines and this month the questions centre on chapters 27 and 28 of the ZX-81 manual which are about the Organisation of Memory and the System Variables. The first request, from Mr Adler of Harpenden is:

"Please explain the meaning of an "address". How can a byte, which is a number, have an address?"

An important part of a computer is its memory and typical microcomputers have several thousand memory locations available for immediate use. Clearly each location needs a separate label or address to distinguish it from its fellows. The word address came into use because writing information to one of many memory locations is similar to writing a letter to one of many people. Letters are sent to an address so that they reach the person who lives there. Similarly, a computer sends information to the memory location at a given address.

Computer addresses are simply whole numbers starting at zero; so, for example, in the unexpanded ZX-81 locations 0 to 8191 are used by the ROM, locations 8192 to 16383 are unused, and locations 16384 to 17407 are used by the RAM. The add-on 16K RAM uses locations 16384 to 32767. Only the contents of RAM may be altered and so users are generally interested in addresses 16384 and upwards.

Each location in memory contains one byte of information. A byte can be thought of as a whole number between 0 and 255 inclusive. In practice, the word byte is often also used to mean a "location in memory" as well as to mean the number which is stored at that location. Thus if location 17000 contains 34, we might say "byte 17000 is 34".

The next question, from Mr Lypartin of Paignton develops our theme:

"I am keen to understand how

my ZX-81 works but as a beginner I am perplexed by the manner in which addresses are stored in the system variables. I know, for example, that D-FILE is the beginning of the display file—but how is that information stored?"

The area at the bottom of RAM between 16384 and 16508 holds the system variables and is followed by the program area, starting at 16509. The display file is next but as programs can vary in length, the display file does not start at a fixed address. The ZX-81 keeps track of it by storing the current value of the starting address in D-FILE.

If you look at page 178 of the manual you will see that the value of D-FILE is stored at address 16396 and so you might infer that you have only to look at the contents of 16396 to find the value of D-FILE.

Unfortunately, that is not true. Remember that the value of D-FILE is an address and that addresses are whole numbers, like 16384 and 17407 and 32767. A single location can only hold a number between 0 and 255 and so two adjacent locations are used to store larger numbers. The value of D-FILE is given by:

value held in 16396 + 256 * value held in 16397

Any whole number between 0 and 65535 inclusive can be stored using this system.

The value held at an address can be found by PEEKing at it and so you can PRINT the value of D-FILE by entering:

PRINT PEEK 16396 + 256 * PEEK
16397

You may know that the contents of the first location in the display file is always 118 and you can show that by entering:

PRINT PEEK (PEEK 16396 + 256 *
PEEK 16397)

Finally, I have been asked many times if there is a simple way of allowing two programs to use the same variables. Mr Peters of Blackpool asks:

"I want to write several programs which use the same data but there seems to be no way to do so using the Sinclair functions. Do I have to write routines to save and

Andrew Hewson, author of *Hints & Tips for the ZX-80* and *Hints & Tips for the ZX-81*, answers questions on hardware and software for

Questions organise



Andrew Hewson: with the right advice.

Sinclair ZX computers. Please address your problems, queries and comments to Andrew at 7 Grahame Close, Blewbury, Oxon.

on how to memory



load data on cassette or is there some way of passing data between programs directly?

There is. The trick is to alter the RAMTOP system variable to give you some space at the top of RAM which is out of reach of the Sinclair system in normal use. Your first program can then copy data into the area above RAMTOP. You can then load a second program, replacing the first, but the data saved above RAMTOP will still be intact. The second program can then copy the data back into its own variables area.

Let us take the job step by step. All the calculations following refer to the unexpanded ZX-81 with values for the 16K expansion in square brackets where they are different.

● **Moving RAMTOP.** Suppose you want to pass a 10-element array between programs. A single-dimensional array occupies five bytes per element plus another six making 56 bytes in all, and so you need at least 56 bytes above RAMTOP.

When you switch on your ZX-81, RAMTOP is set automatically to one more than the top of RAM, i.e., 17408 [32768 with the 16K RAM]. The address is stored as a system variable at 16388 and 16389 as the values 0 and 68 respectively [0 and 128], because $0 + 256 * 68 = 17408$ [$0 + 256 * 128 = 32768$].

You can use your ZX-81 to calculate the new value to be POKEd into 16388 by entering:

```
PRINT 17408 - N - 256 * INT((17408 -
N)/256)
[PRINT 32768 - N - 256 * INT((32768
- N)/256)]
```

Using $N = 56$ for our example gives 200.

The value to be POKEd into 16389 is given by:

```
PRINT INT((17408 - N)/256)
[PRINT INT((32768 - N)/256)]
```

In our example the result is 67 [128].

The ZX-81 will ignore any alterations to RAMTOP until you enter NEW, so do so at that point. Of course, if you have a program in your machine you should SAVE it first.

● **Finding your array.** Variables are stored at the address held in VARS at 16400 and 16401 so you can PRINT

the current value by entering:

```
PRINT PEEK 16400 + 256 * PEEK
16401
```

● **Saving an array above RAMTOP.** The following program demonstrates the technique:

```
10 DIM A(10)
20 FOR I=1 TO 10
30 LET A(I)=I
40 NEXT I
50 LET J = PEEK 16400 + 256 * PEEK
16401
60 LET K = PEEK 16388 + 256 * PEEK
16389
70 FOR I=0 TO 55
80 POKE (K+I), PEEK (J+I)
90 NEXT I
```

Lines 10 to 40 assign the array and set its values to 1...10—these values have been chosen for the purposes of this demonstration and have no special significance. Line 50 stores the value of VARS in J and line 60 stores the value of RAMTOP in K. The loop at lines 70 to 90 copies the contents of the array above RAMTOP.

● **Retrieving an array from above RAMTOP.** Now delete the first program and enter the following:

```
10 DIM A(10)
50 LET J = PEEK 16400 + 256 * PEEK
16401
60 LET K = PEEK 16388 + 256 * PEEK
16389
70 FOR I=0 TO 55
80 POKE (J+I), PEEK (K+I)
90 NEXT I
100 FOR I=1 TO 10
110 PRINT A(I)
120 NEXT I
```

In this program the array is assigned and J and K are set to VARS and RAMTOP as before but the loop at lines 50 to 780 now copies the data from above RAMTOP to the variables area. The loop at lines 100 to 120 PRINTs the values of the array as set by the first program.

In each case, lines 50 to 90 represent the essential part of the program but it is important to assign the array at the beginning of the program, so that it lies at the bottom of the variables area. The same technique works for ordinary variables but strings cannot, in general, be copied in this manner, because they can move around in RAM.

Sigma Technical Press

The UK Software Publisher

BYTEING DEEPER INTO YOUR ZX81

by M. Harrison



byteing
deeper
into your ZX81

Mark Harrison

Sigma Technical Press
(the U.K. software publisher)

The ZX81 Microcomputer is now, debatedly, the fastest selling personal computer in the U.K. Unfortunately, the user's manual can not answer all the questions and problems that arise when using the ZX81. Also, the user's manual gives the distinct impression of being written by an engineer, for engineers . . . not for the average user of the ZX81. The only way you can see the manual is by buying the machine. BYTEING DEEPER INTO YOUR ZX81 supplements the ZX81 manual and provides an excellent introduction to computer programming. It starts from first principles, and, by reference to over 30 carefully graded examples, progresses to some of the most advanced techniques useable on this computer. It presents detailed projects and programs for the user to solve; each of these is suitable for domestic use (e.g. games, personal data banks, and homework aids). All but two programs will run on ZX80.

December 1981
0905104 137

160pp
paper only £4.95



Distributed by
John Wiley & Sons Limited
Baffins Lane · Chichester · Sussex PO19 1UD
England

1K ZX81 ADULT GAMES
FOR JADED MINDS. BAD
TASTE IS OUR SPECIALITY

cassette No. 1
for the over 16's
£3.00

Can of Worms



ACNE



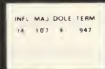
VASECTOMY



SMUT



HITLER



DOLE



ROYAL FLUSH



REAGAN



P's N' Q's

cassette No. 2
for the over 18's
£5.00

DEATH



EDUCATION



CONCEPTION



BIRTH



RUBICS DUBE



ON THE JOB



POX



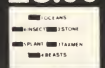
DR. DEATH



OD

cassette No. 3
for the over 16's
£5.00

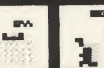
THE BIBLE



GENESIS



ADAM & EVE



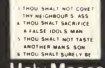
NOAH



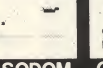
PLAGUES



EXODUS



Holy Moses



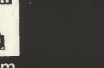
SODOM



GOLIATH



JONAH



Bethlehem

prices include bizarre audio intros, revoltingly descriptive instructions, postage & package.
send to: AUTOMATA LTD., (Dpt. Z), 65A Osborne Road, Portsmouth PO5 3LR, Hants.

ZX81

ZX81

JOIN

ZX-GUARANTEED

(CLUB IS DEVOTED EXCLUSIVELY TO ZX81)

ALL GAMES/PROGS. GUARANTEED ERROR-FREE. ZX-GUARANTEED IS NOT JUST GAMES, IT IS INTENDED TO BE EDUCATIONAL. INCLUDES ARTICLES ON BASIC, PEEK, POKE, MACHINE CODE, FLICKER FREE PROGRAMMING, HINTS AND TIPS, ETC, ETC.

MEMBERSHIP IS APRIL TO APRIL, IF YOU JOIN LATE, CURRENT YEARS BACK ISSUES WILL BE SENT.

MEMBERSHIP £5 PER YEAR (EUROPE £6.50)

AIRMAIL OUTSIDE EUROPE £10

PLEASE MAKE CHEQUES/P.O./DRAFTS
PAYABLE TO: ZX-GUARANTEED.

SAMPLE LAST YEARS BACK ISSUE £1 PLUS
SAE OR SAE FOR DETAILS.

G. A. BOBKER
29 CHADDERTON DRIVE, UNSWORTHY,
BURY, LANCS.

TEL: 061-766 5712

Lack of ZX81 memory giving you headaches..?



The Memotech 64K Memopak

The growth of interest in computer use caused by the introduction of the Sinclair ZX81 has made new and exciting demands on the ingenuity of electronic engineers. At Memotech we have focused our attention on the design of an inexpensive, reliable memory extension.

The Memopak is a 64K RAM pack which extends the memory of the ZX81 by a further 56K. Following the success of our 48K memory board the new memory extension is designed to be within the price range expected by Sinclair users. It plugs directly into the back of the ZX81 and does not inhibit the use of the printer or other add-on boards. There is no need for an additional power supply or for leads.

The Memopak together with the ZX81 gives a full 64K, which is neither switched nor paged, and is directly addressable. The unit is user transparent and accepts such basic commands as 10 DIM A(9000) 0-8K ...Sinclair ROM

8-16K...This section of memory switches in or out in 4K blocks to leave space for memory mapping, holds its contents during cassette loads, allows communication between programmes, and can be used to run assembly language routines.

16-32K...This area can be used for basic programmes and assembly language routines.

32-64K...32K of RAM memory for basic variables and large arrays.

With the Memopak extension the ZX81 is transformed into a powerful computer, suitable for business, leisure and educational use, at a fraction of the cost of comparable systems.

**DEALER
ENQUIRIES
WELCOME**



Memotech Ltd
3 Collins Street
Oxford · OX4 1XL
Tel · 722102/3/4/5

Please debit my
BARCLAYCARD
ACCESS*
account number:

*Please delete
whichever does not apply.

Signature

Date

NAME

ADDRESS

Please rush me:

	Quantity	Price	Total
64K RAM, Assembled		£68.69	
HINTS & TIPS FOR ZX81 (BOOK BY ANDREW HEWSON)		£4.25	
Stock Control Programme		£ 25.00	
Payroll Programme		£ 25.00	

VAT @ 15%

Postage

SUI TOTAL

To: Memotech Ltd., 3 Collins Street, Oxford, OX4 1XL Telephone (0865) 722102

"THE BEST ZX81 BOOK"

THE ZX81 COMPANION



Bob Maunder

LINSAC

If you have a Sinclair ZX81 and want to use it to its full potential then, as the experts have all agreed, this is the book for you. It contains detailed guidelines and documented programs in the areas of gaming, information retrieval and education, as well as a unique listing of the 8K ROM for machine code applications.

'Far and away the best... once again Linsac has produced the book for the serious end of the market'. - *Your Computer*, November 1981.

The ZX81 Companion is a most professional product... with many good illustrative programs, tips and warnings'. - *Education Equipment*, October 1981.

'Bob Maunder's attempt to show meaningful uses of the machine is brilliantly successful... thoughtfully written, detailed and illustrated with meaningful programs... To conclude - the book is definitely an outstandingly useful second step for the ZX81 user'. - *Educational ZX80/81 Users' Group Newsletter*, September 1981.

Send your cheque for **£7.95** (includes UK p&p) to:

LINSAC (SU) 68 Barker Road, Linthorpe,
Middlesbrough TS5 5ES.

ISBN 0 907211 01 1

Price **£7.95**

**** 16K RAM pack ****
assembled, tested and cased.
£37.50 inc P&P
(Allow 21 days delivery)

Music	1K	£2.95
Music	2-16K	£3.95
Nightmare Park	14K	£4.95
High Res. Graphics	16K	£3.95
Space Invaders	1K	£4.95
Space Invaders (13)	3K	£5.95
Breakout (B1)	1K	£3.95
Dragon Maze	16K	£4.95
Planetoids	16K	£3.95
Scroll /		
Rolling Riter	1-16K	£2.95
Life	16K	£3.95
Star Trek	16K	£4.95
Mission of the Deep	16K	£5.95
Fruit Machine and Pontoon	16K	£2.95
Space Rescue	16K	£3.95
Warrior	16K	£4.95
3D 'O' & 'X's		
+ Connect Four	16K	£5.95
Assembly B1 listing	1K	£5.95
Assembly I3 listing	3K	£8.95
Hex. Ldr/D. listing	1K	£1.00

*** No hardware modifications * whatsoever.**

S.A.E. for catalogue
All programs supplied on cassette with instructions
Send remittance with order
(Cheque, P.O. Card No.) to:-

MACRONICS
Dept. S.U.
26 Spiers Close
Knowle
Solihull
West Midlands B93 9ES

**.. quality games and special techniques
the widest range available from one supplier !**

THE INTRODUCTION of the ZX-81 into an educational environment has greater value than many people imagine. It may look like a toy—and perhaps deserved the label when first introduced—but independent suppliers have joined forces with Sinclair to produce an impressive array of additions which enhance the machine considerably, RAM expansion, high-quality software and peripherals mean the ZX-81 is capable of sophisticated operations.

From simple awareness to program writing and word processing, the ZX-81 has value and can withstand a surprising amount of robust hands-on use, given a certain amount of attention with a soldering iron. The beauty of this particular micro is, of course, its price. Educational suppliers include Sinclair Research, Griffin and George and W H Smith, all of which offer the official range of hardware and software, most with educational discounts.

For the same price as the Pet or Apple, for instance, you could buy 10 ZX-81s, providing a greater spread of usage. The machine obviously has limitations—the absence of disc storage, for example—and cannot compare to the versatility of some of the more powerful micros but it performs admirably within its scope.

Students at North London Polytechnic and at many other higher education establishments consider the ZX-81 to be a standard piece of equipment, something without which they cannot manage to handle standard number-crunching, program analysis and computing/statistical study in specific subject applications.

At the other end of the curriculum, the ZX-81 is a useful tool in primary education. The only disadvantage might be the keying-in of input—the touch-sensitive keyboard may prove difficult for younger children to use. The cost of the ZX-81 is well within the limited budget of a primary school and is a worthwhile investment to enable children to develop an awareness and can be used to present material in an unusual and interesting way.

Why Sinclairs are such a smash hit

From primaries to polytechnics... the whole education spectrum is using ZX-81s



Sheffield schoolchildren and their ZX-81s.

One branch of the Youth Opportunities Programme aims to give hands-on experience to a number of unemployed teenagers. Using two ZX-81s, the youngsters tried simple programming techniques, gaining a valuable awareness of what a computer is capable of doing. Some of the users have written their own programs and developed some interesting applications, including control experiments.

One school which, despite a long wait for delivery of two ZX-81s, is now using the micros happily is Arbourthorne Middle School, Sheffield. Originally, it was intended to use the ZX-81s for staff familiarisation in computer hardware and programming techniques. Stephen Dommatt, a member of staff keen to promote the use of micros in the school, decided to try the equipment with his pupils.

Together with a series of home-designed work sheets, he was

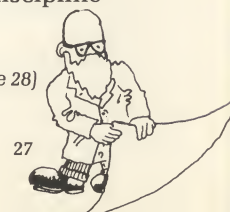
encouraged by pupil response. Interested children in his class arrived early, worked through their lunch break and stayed after hours. He had this to say about his experience:

"The single-stroke keywords? Confusing at first, I admit, but it takes about two minutes to get the idea and it makes children's typing much faster. Non-standard Basic? Who cares? By the time children using the ZX-81s are ready for something with disc drives and high-resolution colour graphics, all the machines and languages will have developed anyway".

After only a short period of work with the ZX-81s, Dommatt makes the following observations:

- Computer programming is a valid subject for 11-year-olds—possibly younger. They have to discipline

(continued on page 28)





(continued from page 27)

their thoughts to use the language, yet creativity and imagination are also required, and rewarded, when a program works.

● The Sinclair is the ideal machine to start, not just because you can afford sufficient of them to make it worthwhile but because of the single-stroke keywords and user-friendly Basic.

"We do not envisage our ZX-81s being used solely for learning programming. It is just that educational programs take longer to develop". In fact, because of increased usage and interest in the ZX-81, there is now a significant number of educational packages, both commercial and home-produced. The educational users group, EZUG, produces a comprehensive list of programs available.

"The plan for this academic year", he comments, "is for all interested

pupils to start programming and for every child in the school to lay hands on a micro for a few minutes each week, playing games which will be entertaining and useful. Only time will tell if it works but it will have been fun for me, too".

The ZX-81 is, there can be no doubt, a sound microcomputer. The PCB is Z-80-based and can cope with the majority of tasks. The area which causes concern, however, when one talks about continued usage with children, is the connections and sockets at the back and sides of the machine.

One hint is to solder the power supply and UHF lead for video output into the main body of the ZX-81. That prevents program crashes, especially in the unstable environment of a school classroom.

The same is true for the RAM expansion packs now available—up to 48K—which greatly enhance the

capabilities of the machine. The connection at the rear is vulnerable and it is advisable to construct some kind of base to which the micro and expansion packs can be attached. Another advisable amendment to the basic system is the addition of a mechanical QWERTY keyboard.

With those changes, however, you are no longer considering a £70 micro but one more in the region of £150. You then have to consider the point of buying an inexpensive system compared to something like the Atom or BBC machine which is more expensive initially but gives you a more sophisticated tool without the need for add-ons.

All things considered, the ZX-81 has an important role to play in the classroom, within its inherent physical limitations. When the sockets are secured and more RAM added, you have a useful piece of equipment—there is no doubt about that.

ZX81 HEWSON CONSULTANTS ZX81

HINTS & TIPS for the ZX81 by ANDREW HEWSON

"Good value and quite fascinating... a very inexpensive way of acquiring months of programming experience"—YOUR COMPUTER Nov 81.

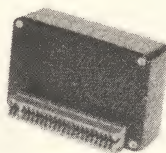
"Excellent... very good value for money"—SYNC.

Chapters on: Saving Space... Understanding the Display File... Converting ZX80 Programs... Chaining Programs (pass data between programs, call subroutines from cassette, establish data files)... Machine Code Programs (write, load, edit, save and debug machine code).

Routines and programs are scattered liberally throughout the text and the final chapter consists of twelve useful, interesting and entertaining programs.

16K RAM £37.50

A top quality add-on 16K dynamic memory specially designed for the ZX81. Simply plugs into the port at the back of your Sinclair. Can be used in conjunction with the ZX printer. Neatly packaged in a black plastic shell to match your ZX81. Incredible value, why pay more?



MEMOPACK 64K RAM £79.00

Developed by Memotech this amazing 64K RAM needs no extra power supply. Simply plugs neatly and firmly into the rear port of your ZX81. Can be used with the ZX printer and other add-on hardware.

Just look at these features

- ★ 8–16K can be switched in and out in 4K blocks to leave space for memory mapping.
- ★ 12–16K can be protected against overwriting during loading from cassette.
- ★ Directly addressable and user transparent.
- ★ Up to 15K of basic program area.
- ★ 32K or more of variables area.

Z80 OP CODES £1.45

A must for the beginner and the experienced programmer alike. This handy ready reckoner lists all 600 plus Z80 machine code instructions in decimal and hexadecimal with their mnemonics. Each Op Code is succinctly explained and cross-referenced. Supplied in a protective transparent wallet for easy reference and durability.

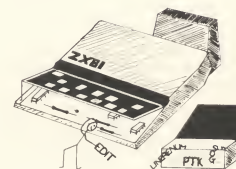
16K SOFTWARE SPACE INTRUDERS £4.95

40 alien ships in each squadron. All action display. Automatic option—the machine plays itself, can you do better? Written in machine code for super fast fun. Squadron after squadron attack your position. Three laser bases. Full score display.



PROGRAMMERS TOOLKIT £6.50

Are you writing your own programs for the ZX81? Then use our TOOLKIT to do the donkey work. Copy it into RAM before you start work then you will have it at your fingertips. Comprehensive LINE RENUMBER including GOTOs and GOSUBs; LOAD, EDIT and RUN machine code programs; INSPECT the ZX81 system routines; COPY them into RAM and PATCH and/or EXTEND them; FIND a given piece of Basic code and REPLACE all occurrences of it; move blocks of Basic lines with EDIT.



LANGUAGE DICTIONARY £3.75

Now you can construct your own English/French, English/Anything dictionary with our LANGUAGE DICTIONARY. UPDATE the entries, SEARCH for a word, CREATE a new dictionary and SAVE it on tape all with the same fully-detailed program.

1K STATISTICS £3.75

Three programs on the one cassette.

- i) Statistics—prints the current mean and standard deviation after each value is entered.
- ii) Regression—prints the current mean and standard deviation of the y and x values and the intercept and slope of the regression line.
- iii) Trend—prints the current mean and standard deviation of the y and x values and the intercept and slope of the trend lines.
- 2) CHI SQUARED TEST—prints the current value of the Chi squared statistic and the current sample size.
- 3) GRAPH PLOT—plots a graph of data entered from the keyboard.

Cheque with order or quote Access or Barclaycard number to:

HEWSON CONSULTANTS, DEPT. SU, 7 GRAHAME CLOSE, BLEWBURY, DIDCOT, OXON OX11 9QE.
Tel: (0235) 850075.

Sinclair Programs

Say hello to the magazine that no Sinclair User can do without

We are proud to announce **Sinclair Programs** which, with its unique formula, is going to prove a great companion publication to **Sinclair User**. The first edition of Sinclair Programs will appear in mid-April and will contain 40 programs covering the whole spectrum of ZX usage... all listed for you to key in. To guarantee you receive the magazine that guarantees you hours of enjoyment fill in the order form below.

ORDER FORM

☐ Please start me a subscription to Sinclair Programs at £6.60 for six issues including postage.
Applies U.K. only.

☐ Please send me a single copy of Sinclair Programs at £1.10 to include postage.
Applies U.K. only.

I enclose a cheque for £.....

Name..... Address.....

Also available at all leading newsagents.

ZX81 SOFTWARE FROM VIDEO SOFTWARE LTD 1K & 16K

16K SOFTWARE

VIDEO-SKETCH (ZX81 only). Move the cursor to any part of the screen. Draw or rub-out as you move it. Mix in text or graphics. Save picture in memory. Save picture sequence on cassette.

VIDEO-PLAN (ZX81 only). Performs the function of an analysis book. Arithmetic functions include addition, subtraction, multiplication.

VIDEO-AD. Rotating display of 16 pages of advertising material. Set-up your own pages and change them as and when required.

VIDEO-GRAPH. Planning and design aid. Create pictures/charts/graphs and store within the program.

VIDEO-VIEW. Do it yourself teletext. Create pages of data. Store them within the program.

VIDEO-MAP (ZX81 only). Educational game based on maps. Navigate your plane to its destination.

FORCE-FIELD (ZX81 only). Animated bombardment game.

SPACE-RACE (ZX81 only). Party game for eight players.

TEST-MATCH. Realistic simulation of a test match series. Dynamic scoreboard.

FOOTBALL-LEAGUE. Realistic simulation of an entire season. Every match played and results shown with progressive league table.

STOCK-MARKET (ZX81 only). An exciting game of skill and judgement. Buy and sell stocks and shares as prices change in response to world events.

PACK 1 - VIDEO-PLAN + VIDEO-AD

PACK 2 - VIDEO-VIEW + VIDEO-GRAPH

GAMESET - VIDEO-MAP + 5 GAMES

1K PARTY TRICKS (ZX81 only)

PRICE

7.95

7.95

7.95

£5.95

5.95

5.95

3.95

3.95

3.95

3.95

3.95

17.95

13.95

19.95

4.95

NEW

VIDEO-INDEX

NEW

Q. How do you store 57,000 characters in a 16K RAM.

A. Use VIDEO-INDEX.

Catalogue your cassettes, your record collection, references to magazine articles. Amazingly versatile. Capacity for 1,000 individual references each of which can generate 57 characters of text. Powerful search facilities once the index has been created.

How is it done? The system cannot really fit 57,000 characters in a 16K RAM. It gives the illusion of doing so by eliminating duplicates. For instance in an index of articles in computer magazines about the ZX81 certain words occur time and again. VIDEO-INDEX detects these duplications and thereby conserves space.

What do you get?

1. A machine code master program which sits at the top of RAM.

This is initially loaded like a BASIC program.

2. A demonstration index containing 1,000 references to articles about the ZX81 in the popular magazines.

3. A detailed instruction manual.

You may then proceed to create your own catalogues and indexes and save them on cassette.

This program is fast, efficient and ingenious and is by far the best product we have introduced for the ZX81.

N.B. There isn't room for a commentary on this cassette so you'll have to read the manual.

ZX81 or ZX80 + 8K ROM.

ZX printer is useful but not essential.

Price: £9.95

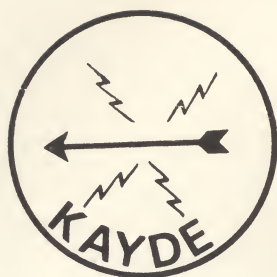
Mail order customers add £1 per order.

Allow 28 days for delivery.

Cash with order please to: **VIDEO SOFTWARE LTD.**

Stone Lane, Kinver,
Stourbridge,
West Midlands DY7 6EQ

Personal callers welcome during office hours.



ZX 80/1 WAR!

Price

£37.95
inc. V.A.T.

ZX KEYBOARD FULLY CASED WITH REPEAT KEY

FULLY CASED KEYBOARD	£37.95
UNCASED KEYBOARD	£27.95
KEYBOARD CASE	£10.95



This is a highly professional keyboard using executive buttons as found on top quality computers. It has a repeat key and comes, complete in its own luxury case. This is a genuine professional keyboard and should not be confused with toy keyboards currently available on the market.

16K RAMPACKS MASSIVE ADD ON MEMORY

WHY WAIT TO PAY MORE
FAST IMMEDIATE DELIVERY

£32.95
inc. V.A.T.

Post to:
Dept SCU
Kayde Electronic Systems
48/49 Exmouth Road
Great Yarmouth
Norfolk NR30 3DP Tel: 0493 57867

All products include VAT are fully
built and tested and come with a
COMPLETE MONEY BACK GUARANTEE

Please send me RAM pack/s £32.95 each
Please send me cased keyboard/s £37.95 each
Please send me uncased keyboard/s £27.95 each
Please send me keyboard case/s £10.95 each

I enclose £.....

Name

Address

Please add £1.50 p/p and make cheques payable to Kayde
Electronic Systems.

8 PAGES OF PROGRAMS

for both the ZX-80 and the ZX-81

INTERCEPT, written for the ZX-80 by Ian Wright of Weybread, Diss, makes good use of POKEing to the screen. The aim of the game is to destroy the enemy missile—a less-than symbol—with your intercept missile (*) before the Federation Freighter—an inverse plus sign—is destroyed.

If you succeed, the Freighter remains on the screen with the

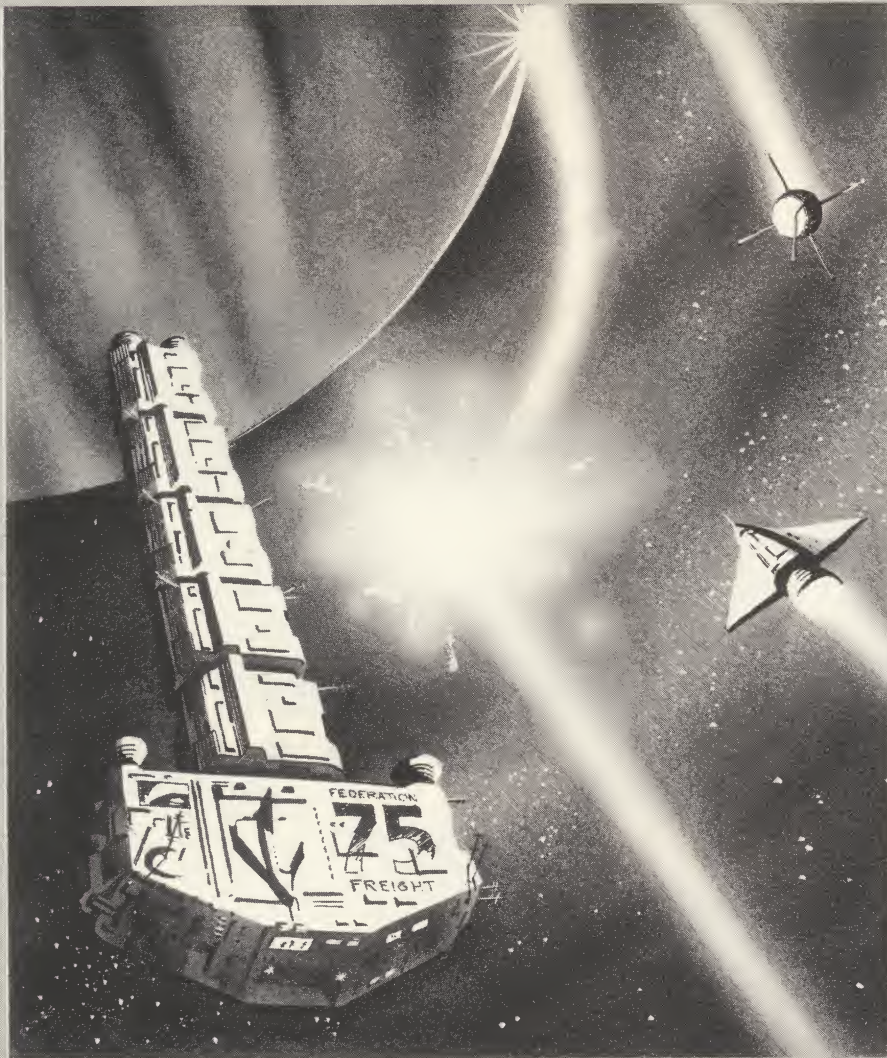
message INTERCEPTED. If you do not, the missile hits and only the message DESTROYED remains. The game is relatively simple if no mistakes are made.

The missile is launched from a different position each time. To make the game more difficult, once you have mastered the version as listed you can delete several lines, making, for example, D equal to 14

and FOR F = 1 TO (527 - 66), and allowing the enemy missile to move at random.

Then, of course, you have the problem of how to make it destroy the Freighter each time, without writing more program than you can fit in 1K. You may well like to tackle the problem. We would be interested in seeing what variations on the game you produce.

INTERCEPT



```
10 LET A$ = "$"
20 LET D = 16
30 LET E = RND(9) + 5
40 LET A = 16794
50 LET G = A + 384
60 LET B = A
70 FOR F = 1 TO 527
100 PRINT " "; (space)
110 NEXT F
120 LET C = A + 33 * D + E
130 LET G = G - 34
140 IF G = B THEN GOTO 600
150 IF G = C THEN GOTO 557
160 IF C < A THEN STOP
170 POKE C, 20
180 B, 147
190 POKE G, 24
200 INPUT A$
210 IF A$ = "" THEN GOTO 200
220 POKE C, 0
230 POKE B, 0
240 POKE G, 0
245 LET B = B + 1
250 LET D = D - 1
260 GOSUB CODE(A$) * 10
270 GOTO 120
490 LET E = E - 2
500 RETURN
550 LET E = E + 1
555 RETURN
557 PRINT "(SHIFTS) INTERCEPTED (SHIFTS)"
558 POKE B, 147
560 STOP
580 LET D = D - 1
590 RETURN
600 PRINT "(SHIFT A) DESTROYED (SHIFT A)"
610 STOP
```


FOURTEEN-year-old Tim Rogers of Richmond, Surrey, provided us with this splendid game, in which you have to steer your space ship—a minus sign followed by a less-than symbol—past the stars which block your path as you whizz across the little inverse universe which the 1K ZX-81 sets up for you in SLOW mode.

Each time the computer creates the universe with stars, you have a chance to see where they are placed, so that when your ship enters the

universe at a random height from the right, you will have some idea of where to steer to avoid them.

Your score is given at the end of the game. Some weird thing happens, about which I will not warn you, when you hit a star. Rogers writes about his program:

"In this game I have used nearly every memory-saving technique I know, including using PI-PI instead of 0 and PI/PI instead of 1.

"I have also used VAL "10" instead of just the number 10. I took the

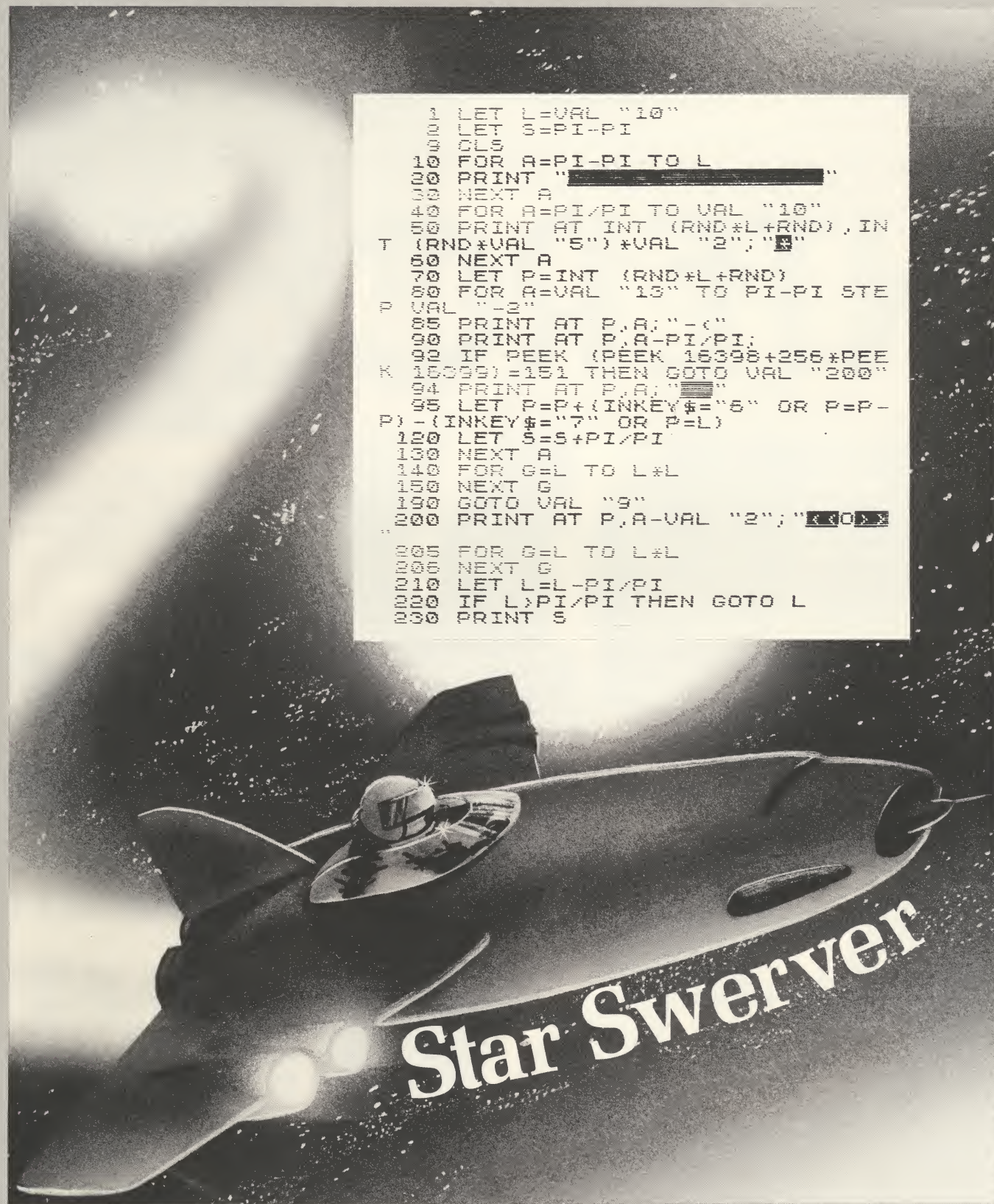
INKEY\$ line from Mark Charlton's book *The Gateway Guide to the ZX-81 and ZX-80* and I think it is very clever. It works like this:

95 LET P=P+(INKEY\$="6" OR P=P-P)-(INKEY\$="7" OR P=L). The variable P is the position up the screen of the space ship, so that if someone is pressing "6", the statement inside the brackets is true and thus returns a 1, which is added to P, and as it is false—i.e., "7" not being pressed—0 is returned and taken away from P".

```

1 LET L=VAL "10"
2 LET S=PI-PI
3 CLS
10 FOR A=PI-PI TO L
20 PRINT " "
30 NEXT A
40 FOR A=PI/PI TO VAL "10"
50 PRINT AT INT (RND*L+RND), IN
T (RND*VAL "5")+VAL "2"; " "
60 NEXT A
70 LET P=INT (RND*L+RND)
80 FOR A=VAL "13" TO PI-PI STE
P VAL "-2"
85 PRINT AT P,A; "-("
90 PRINT AT P,A-PI/PI;
92 IF PEEK (PEEK 16398+256*PEE
K 16399)=151 THEN GOTO VAL "200"
94 PRINT AT P,A; " "
95 LET P=P+(INKEY$="6" OR P=P-
P)-(INKEY$="7" OR P=L)
120 LET S=S+PI/PI
130 NEXT A
140 FOR G=L TO L*L
150 NEXT G
160 GOTO VAL "9"
200 PRINT AT P,A-VAL "2"; " "
205 FOR G=L TO L*L
210 NEXT G
210 LET L=L-PI/PI
220 IF L>PI/PI THEN GOTO L
230 PRINT S

```




```

10 REM SQUARE ROOT SOLVER
20 REM (C) HARTNELL 1982
30 SCROLL
40 PRINT "WHICH NUMBER DO YOU
WANT ME"
45 SCROLL
50 PRINT "TO FIND THE SQUARE R
OOT OF?"
60 INPUT B
70 IF B<0 THEN GOTO 60
80 LET A=INT (RND*B)+1
90 LET X=B/A
100 LET Y=(X+A)/2
110 SCROLL
115 PRINT Y
117 SCROLL
120 PRINT "ERROR IS ";ABS (Y-SQ
R (B))
130 IF A=Y THEN GOTO 160
140 LET A=Y
150 GOTO 90
160 SCROLL
165 SCROLL
170 PRINT "THE SQUARE ROOT IS "
;Y

```

WHICH NUMBER DO YOU WANT ME
TO FIND THE SQUARE ROOT OF?

```

5
ERROR IS 2
3.4
ERROR IS 0.4
3.0235294
ERROR IS .023529412
3.0000916
ERROR IS .000091554597
3
ERROR IS 1.8626452E-9
3
ERROR IS 0
3
ERROR IS 0

```

THE SQUARE ROOT IS 3

WHICH NUMBER DO YOU WANT ME
TO FIND THE SQUARE ROOT OF?

```

1.5
ERROR IS .085786437
1.4166667
ERROR IS .0024531037
1.4142157
ERROR IS 2.1234155E-6
1.4142136
ERROR IS 4.6566129E-10
1.4142136
ERROR IS 4.6566129E-10

```

THE SQUARE ROOT IS 1.4142136



```

10 FOR N=0 TO 43
20 PLOT 20,N
30 PLOT N,21
40 NEXT N
100 INPUT A$
120 FOR X=-5 TO 5 STEP .25
125 IF X=0 THEN NEXT X
130 LET Y=VAL A$
140 IF Y<43 AND Y>-43 THEN PLOT
X*4+20,Y/2+21
150 NEXT X
160 GOTO 100

```



SQUARE ROOT

SQUARE ROOT Solver will work out the square root of any number you enter. It first guesses—line 80—by picking any number between zero and the number chosen. The computer then refines that guess by division, over and over again, checking each time to see how close to the correct answer it is.

Line 120 is not part of the computer checking apparatus—which you can verify by deleting the line—but is there so that you can watch the action of the computer as it searches for the correct answer.

As the ZX-81 has SQR function, the program is of little practical use but it is fascinating to run and watch how quickly it finds the correct answer. In the two sample runs, the computer is looking for the square root of nine—example one—and of two—example two.

GRAPH PLOTTER

THIS PROGRAM, which is fascinating to run, was written for a 1K ZX-81 by R Easto of Reigate, Surrey. He describes it as follows:

"The program plots the graph of any curve entered in the form 'X*X-2+4*X' or even '1/X'. Line 130 is the heart of the program, where the VAL command puts Y equal to the values of X required by your formula (entered in line 100). The program allows more than one curve to be viewed at once."

The three sample curves plotted are X*X, X*X*X+4*X*X and 39/X. Do not use the shift H key (**) for powers of X as an error will result.


```

1 REM OTHELLO BY G.D.CHARLTON
10 GOTO 710
20 LET D=5
30 LET D=D+D(X)
40 LET C=CODE A$(D)
50 RETURN
60 FAST
70 LET H=0
80 FOR B=12 TO 89
90 LET J=0
100 LET Q=0
110 LET D=B
120 IF A$(D)<>" " THEN GOTO 330
130 FOR X=1 TO 8
140 LET K=0
150 GOSUB 20
160 LET K=K+1
170 IF C<>45 THEN GOTO 200
180 GOSUB 30
190 GOTO 160
200 IF C<>40 THEN GOTO 230
210 IF K<2 THEN LET K=0
220 LET Q=Q+K
230 NEXT X
240 LET B#=STR$ B
250 LET Y=VAL B$(1)
260 LET Z=VAL B$(2)
270 IF Y=1 OR Y=8 THEN LET Q=Q*
2
280 IF Z=2 OR Z=9 THEN LET Q=Q*
2
290 IF Y=2 OR Y=7 OR Z=3 OR Z=8
THEN LET Q=Q/2
300 IF (Y=1 OR Y=8 OR Z=2 OR Z=
9) AND (Y=2 OR Y=7 OR Z=3 OR Z=8
) THEN LET Q=Q/4
310 IF Q>H THEN LET H=B
320 IF Q>H THEN LET H=0
330 NEXT B
340 IF H=0 THEN GOTO 440
350 FOR X=1 TO 8
360 LET D=M
370 GOSUB 30
380 IF C=45 THEN GOTO 370
390 IF C<>40 THEN GOTO 430
400 FOR A=M TO D STEP D(X)
410 LET A$(A)="C"
420 NEXT A
430 NEXT X
440 IF H=0 THEN LET J=320
450 GOSUB 640
460 PRINT "YOUR MOVE?"
470 INPUT G$
480 PRINT AT 16,8;" "
490 FAST
500 LET G=VAL G$
510 IF G=0 THEN GOTO 60+J
520 IF G<0 OR G>100 THEN GOTO 4
70
530 FOR X=1 TO 8
540 LET D=G
550 GOSUB 30
560 IF C=40 THEN GOTO 550
570 IF C<>45 THEN GOTO 610
580 FOR A=G TO D STEP D(X)
590 LET A$(A)="H"
600 NEXT A
610 NEXT X
620 GOSUB 640
630 GOTO 60

```

OTHELLO is based on the game Reversi, which was invented in 1888. Reversi was played on a standard draughts board, using pieces which were double-sided, black on one side, red on the other, R C Bell explains, in his book *Discovering Old Board Games*, Shire Publications Ltd, Aylesbury, 1980, that black begins the game by placing a piece black side up on one of the four central squares on the empty board.

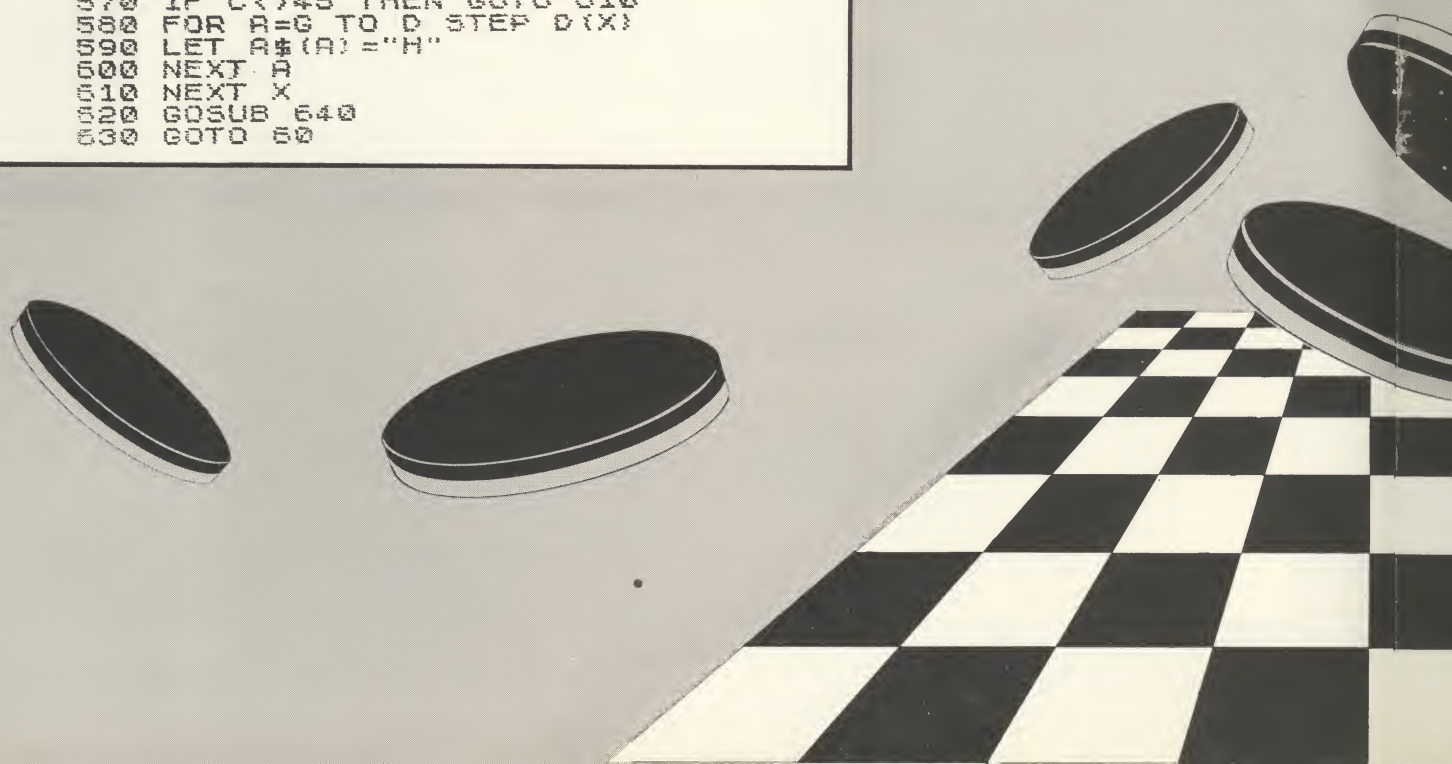
Red replies by placing his first piece red side up on another central square. "The four squares are covered in the first four turns of play and then the players continue alternately, placing their pieces on a square adjacent to one occupied by an enemy piece", says Bell.

Any enemy pieces in a straight line between the latest piece placed and another one of the player's pieces is then flipped over to show the colour of the player. The winner is the player with the most pieces when the board is covered, or when neither player may move.

A member of the National ZX-80 and ZX-81 Users' Club, G J Suggett, of Chichester, Sussex points out, when discussing computer Othello, which is simply Reversi with a restriction on the opening position:

"Most published Othello programs evaluate the best move for the computer to make on the basis of

OTHELLO



maximising the number of captures made with a possible extra score given to certain positions, such as the corners.

"In fact, in the early stages of the game, positional play is far more important than making a large number of captures".

This program, by Graham Charlton and Tim Hartnell, lends more weight to position than to the number of pieces available to convert. When you press RUN, you will see the board appear with the four first pieces in place. You enter a move by entering the number down the left-hand edge of the board next to the square where you want to move, then the number across the board of that square. Enter those numbers as a single number, such as 36, then press NEWLINE. Enter zero if you are unable to make a move.

Once you have played a few games with the program, you might like to alter its strategy slightly by changing the 2 in lines 1220, 1230, 1240, 1250, 12650 and 1270 into 3 or even try deleting the lines completely, perhaps by adding 1215 GOTO 1280. The name Othello is copyright by Mine of Information, which sells a sophisticated ZX-81 machine code program under that name. A 1K version of the game, also in machine code, is available from Logan Software.

program

```

640 SLOW
650 PRINT AT 6,8;
660 FOR F=1 TO 100
670 PRINT A$(F);
680 IF 10*INT (F/10)=F THEN PRI
NT TAB 8;
690 NEXT F
700 RETURN
710 FAST
720 LET H=0
730 LET K=0
740 DIM D(8)
750 LET D(1)=-11
760 LET D(2)=-10
770 LET D(3)=-9
780 LET D(4)=-1
790 LET D(5)=1
800 LET D(6)=9
810 LET D(7)=10
820 LET D(8)=11
830 LET S=0
840 LET R=0
850 LET A$="234567891
10 CH 56 67 HC 45
860 GOSUB 640
870 GOTO 60
880 FOR F=1 TO 100
890 IF A$(F)="C" THEN LET S=S+1
900 IF A$(F)="H" THEN LET R=R+1
910 NEXT F
920 PRINT "I SCORED ";S;"YOU SC
ORED ";R

```

```

23456789
1
2
3
4 HC
5 CH
6
7
8
23456789

```

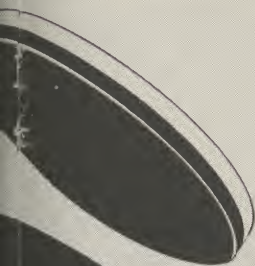
```

23456789
1000000001
2000000002
3000000003
4000000004
5000000005
6000000006
7000000007
8000000008
23456789

```

I SCORED 27 YOU SCORED 37

ELLO



BLACKJACK

THE CARD GAME Blackjack is very popular. In his book *Beat the Odds, Microcomputer Simulations of Casino Games*—Hayden, 1980—Hans Sagan says it is “probably the most popular and most widely-played banking card game in the States. It is played in gambling houses, private clubs, political club-rooms, barracks, troop transports, back rooms of all kinds, and places you may never have heard of”.

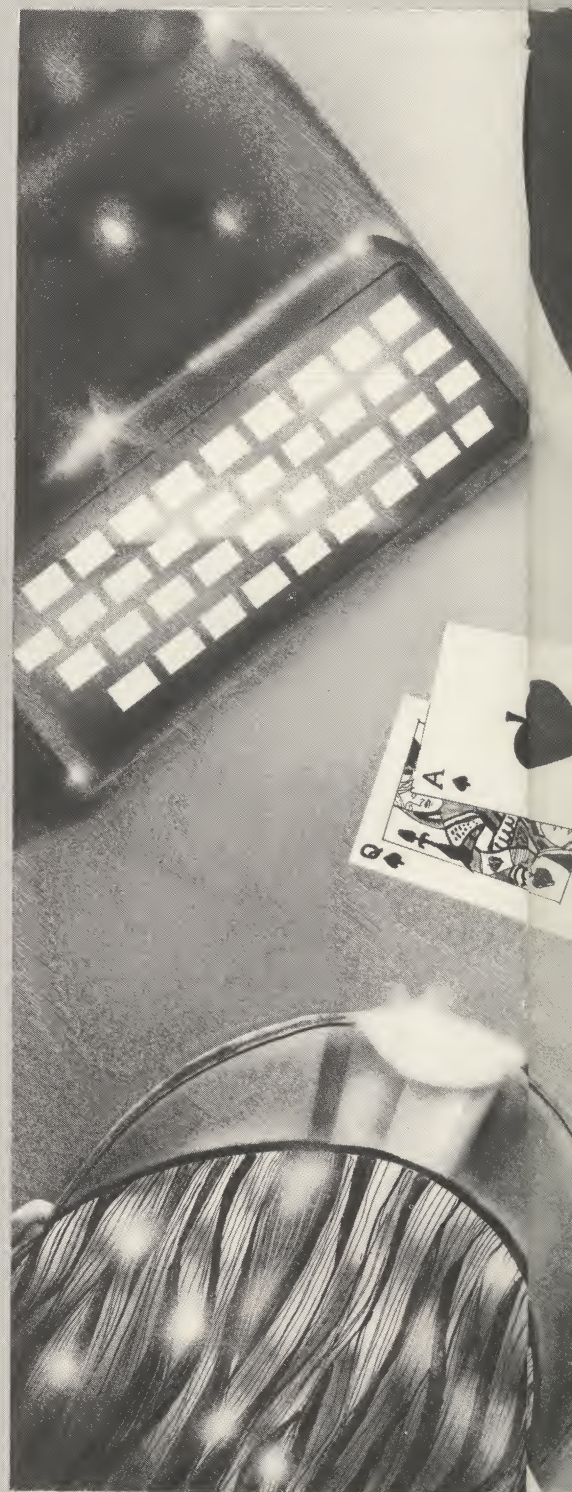
John Scarne, in his authoritative *Scarne's Encyclopedia of Games*, agrees: “Blackjack is the most widely-played banking card in the world”.

Sagan says Blackjack is “the one casino game where the player may have a chance”. Part of that chance is based on the fact that the cards removed from a pack as the game is played change the odds of other cards appearing—and knowing the odds can be of some benefit in deciding what to do. The player advantage is stymied in this version because the ZX-81 has somehow acquired an infinite, constantly-replenished pack of cards.

Despite that, the computer plays reasonably well and will certainly give you a run for your money. There is no direct betting in the game and

```

5 REM BLACKJACK
  (C) HARTNELL 1982
7 LET M=0
10 GOTO 160
20 LET CA=INT (RND*11)+1
30 IF CA=11 AND D+CA>21 THEN L
ET CA=1
35 LET D=D+CA
36 SCROLL
37 IF M>1 THEN PRINT CA;" HAS
BEEN DEALT"
38 LET M=M+1
40 RETURN
50 LET CA=INT (RND*11)+1
60 IF CA=11 AND B+CA>21 THEN L
ET CA=1
65 LET B=B+CA
66 SCROLL
67 IF M>1 THEN PRINT CA;" HAS
BEEN DEALT"
70 RETURN
80 SCROLL
85 PRINT "ENTER 1 FOR ANOTHER
CARD"
86 SCROLL
87 PRINT TAB 3;"OR 0 TO STAND"
90 INPUT G
100 RETURN
110 SCROLL
112 PRINT "ANOTHER GAME, CARDSHA
RP?"
120 INPUT A$
125 LET M=0
130 IF A$<>"NO" THEN GOTO 160
135 SCROLL
140 PRINT "OK, THANKS FOR PLAYI
NG";END
160 SCROLL
161 SCROLL
162 SCROLL
165 LET D=0
170 LET B=0
180 GOSUB 20
190 LET H=CA
200 GOSUB 20
210 LET A=CA
220 GOSUB 50
230 LET E=CA
240 GOSUB 50
250 LET F=CA
  
```



STACK

that is a feature you may well want to add in due course. You may also like to change the program so that it goes through a pack of cards before there is a need to re-shuffle. You can store the pack in a REM statement or in an array.

Blackjack is not difficult to play. You and the computer add the total of the cards you hold, trying to go as close as possible to 21, without exceeding 21. Aces count as either one or 11, and kings, queens and jacks each count 10. The program assigns a value of one automatically to an ace if counting it as 11 would force the total above 21.

The computer deals two cards to the human and one to itself. You have the option of taking another card at any time during your turn, or sticking—that is, staying with the cards you hold.

The round is a draw if both reach the same total less than 21. If you bust—exceed 21—the dealer (ZX-81) wins the round automatically. You need around 2½K for the game.

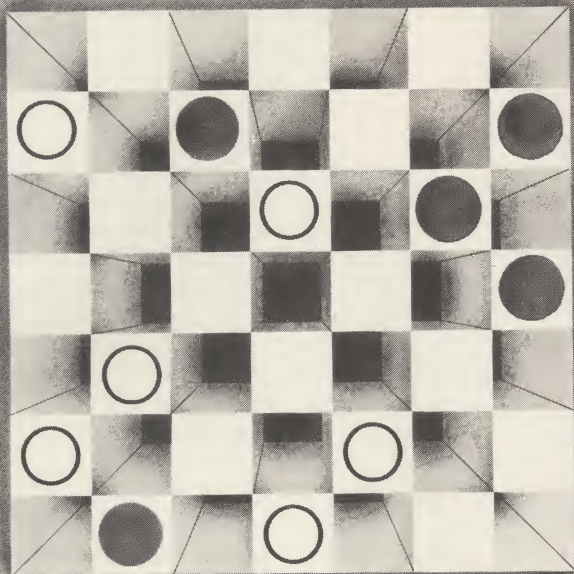
Note the use of the word End in line 140. That is not a mistake and it stops the program because the computer 'reads' the word END as unassigned variable and stops the program with an error message.

```

260 LET B$=" THE ZX81 HAS "
270 LET C$="THE HUMAN HAS "
285 SCROLL
290 PRINT B$;H
295 SCROLL
300 PRINT C$;E;" AND ";F
305 SCROLL
310 PRINT TAB 4;"TALLING ";E+
"
315 LET D=H+A
320 LET B=E+F
340 GOSUB 80
350 IF G=1 THEN GOTO 430
360 IF D<17 THEN GOTO 530
370 SCROLL
372 IF D<>21 THEN PRINT B$;D
375 SCROLL
380 IF D<>21 THEN PRINT C$;B
385 SCROLL
390 IF B=D AND B<>21 THEN PRINT
"SO THIS ROUND IS A DRAW"
400 IF B>21 OR D>21 THEN GOTO 1
10
405 SCROLL
410 IF B>D THEN PRINT "YOU WIN"
420 IF B<D THEN PRINT "I WIN"
430 GOTO 110
490 GOSUB 50
500 SCROLL
505 PRINT C$;CA;" TOTAL ";B
510 SCROLL
512 IF B>21 THEN PRINT ">>>>BUS
TED"
515 IF B>21 THEN GOTO 110
520 GOTO 340
530 SCROLL
534 PRINT B$;D
535 FOR Y=1 TO 60
536 NEXT Y
540 GOSUB 20
550 SCROLL
570 PRINT "TOTAL IS NOW ";D
575 FOR Y=1 TO 60
576 NEXT Y
577 SCROLL
580 IF D>21 THEN PRINT ">>>>BUS
TED"
590 IF D<17 THEN GOTO 540
600 GOTO 370

```


Old Forty-niner



THIS GAME is somewhat like draughts, except that it is played on a 7×7 board, hence the name *Old Forty-niner*. The pieces move as draughts pieces—diagonally one square, jumping over an opponent for a capture into an empty square beyond the opponent. The main differences from draughts, apart from the size of the board, are that pieces may move forward and backward at will, there are no kings—every piece can move as if it is a king—and there are no multiple jumps.

The computer is the Xs moving down the screen and you are the Os. You move by entering the number of the square from which you are moving—entering the number along the left-hand edge first, then the number across the top, then pressing NEWLINE—then the number of the square from which you are moving.

The ZX-81 keeps track of the score, tells you before it moves its pieces to which square it is moving, and terminates the game as soon as one player manages to capture five of the opponent's pieces.

The program, which needs about $3\frac{1}{2}$ K, was written by Tim Hartnell and shows some structured programming techniques. Line 30 sends the action to a subroutine at the end of the program which initialises the variables. The computer then goes to its move routine, starting at 7000.

Having made a move, it returns to line 50, enters the SLOW mode and

goes to the subroutine at line 8000 to print-out the board. From there it goes to subroutine 6000 to accept the player's move, to 8000 to reprint the board, into FAST (line 100) then back to make the computer's next move, and so on.

The advantage of working in that way, with a specific subroutine for each section of the program, is that you can easily alter part of the program which appears unsatisfactory without facing the danger of running out of lines, or of getting lost. Placing the variables assignment at the end has the advantage that you can add new ones, as the need for them becomes apparent, without problems. The layout of the program is simple:

1-1000 Main loop, sends action to various subroutines.

6000-6990 Accepts players move, updates score for player.

7000-7470 Makes computer's move, updates ZX-81 score.

8000-8990 Prints-out board, score, checks if game is over.

9000-9140 Assigns variables.

Although this is not the most memory-efficient method of programming, it makes the work of debugging and future development of a program much easier.

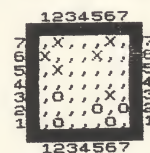
If you would like to learn about structured and top-down programming, you could do well to read *Basic With Style* by Paul A Nagin and Henry F Ledgard, published by the Hayden Book Co Inc.

```

5 FAST
30 GOSUB 9000
40 GOSUB 7000
50 SLOW
60 GOSUB 8000
70 GOSUB 6000
80 GOSUB 3000
100 FAST
110 PRINT AT 0,0;
1000 GOTO 40
6000 PRINT AT 2,0;"FROM?"
6010 INPUT M
6020 PRINT AT 2,0;M;" TO?"
6030 INPUT N
6040 PRINT AT 2,0;" "
6050 PRINT AT 0,0;
6060 LET H(N)=52
6070 IF ABS (M-N)=22 OR ABS (M-N)=18 THEN LET H((M+N)/2)=26
6080 IF ABS (M-N)=22 OR ABS (M-N)=18 THEN LET ME=ME+1
6090 LET H(M)=26
6100 RETURN
7010 FOR A=76 TO 12 STEP -1
7020 IF H(A)<>61 THEN GOTO 7060
7030 FOR B=1 TO 4
7040 IF A<28 AND B<3 THEN GOTO 7050
7050 IF A>60 AND B>2 THEN GOTO 7060
7060 LET Q=2*Z(B)
7070 IF H(A+Z(B))=52 AND H(A+Q)=26 THEN GOTO 7070
7080 NEXT B
7090 GOTO 7300
7100 LET H(A+Z(B))=26
7110 LET H(A)=26
7120 LET H(A+Q)=61
7130 LET Y=A+Q
7140 LET X=A
7150 LET IT=IT+1
7160 RETURN
7310 LET Y=0
7320 LET Y=Y+1
7330 LET K=INT (RND*66)+12
7340 IF H(K)<>61 AND Y<100 THEN GOTO 7320
7350 IF H(K)<>61 THEN GOTO 7460
7360 FOR T=1 TO 4
7370 IF H(K+Z(T))=26 THEN GOTO 7400
7380 NEXT T
7390 IF Y<70 THEN GOTO 7310
7395 GOTO 7460
7400 LET H(K+Z(T))=61
7410 LET H(K)=26
7420 LET X=K
7430 LET Y=K+Z(T)
7440 RETURN
7450 PRINT "I CONCEDE"
7460 STOP
8010 PRINT "I MOVED FROM ";X;" T
O ";Y
8015 PRINT
8020 PRINT "SCORES: YOU: ";ME;"M
E: ";Y
8040 PRINT
8050 PRINT TAB 8;" 1234567"
8055 PRINT TAB 8;" "
8060 FOR J=70 TO 10 STEP -10
8061 LET A=H(J+1)
8062 LET B=H(J+2)
8063 LET C=H(J+3)
8064 LET D=H(J+4)
8065 LET E=H(J+5)
8066 LET F=H(J+6)
8067 LET G=H(J+7)
8080 PRINT TAB 7;J/10;" ";CHR$(
A);CHR$(B);CHR$(C);CHR$(D);CH
R$(E);CHR$(F);CHR$(G);" ";J/1
0
8090 NEXT J
8100 PRINT TAB 8;" "
8110 PRINT TAB 8;" 1234567"
8120 IF IT=5 OR ME=5 THEN GOTO 8
140
8130 RETURN
8140 IF IT=5 THEN PRINT "I WIN"
8150 IF ME=5 THEN PRINT "YOU WIN"
8990 STOP
9000 LET IT=0
9010 LET ME=0
9020 DIM H(99)
9025 DIM Z(4)
9030 FOR A=1 TO 99
9040 IF A>77 OR A=70 OR A=60 OR
A=68 OR A=69 OR A=50 OR A=59 OR
A=58 OR A=40 OR A=49 OR A=48 THE
N GOTO 9090
9055 IF A=30 OR A=38 OR A=39 OR
A=20 OR A=28 OR A=29 OR A=11 THE
N GOTO 9090
9060 LET H(A)=26
9070 IF A=72 OR A=74 OR A=76 OR
A=51 OR A=53 OR A=65 OR A=67 THE
N LET H(A)=61
9080 IF A=21 OR A=23 OR A=25 OR
A=27 OR A=12 OR A=14 OR A=16 THE
N LET H(A)=52
9090 NEXT A
9100 LET Z(1)=-11
9110 LET Z(2)=-9
9120 LET Z(3)=11
9130 LET Z(4)=9
9140 RETURN

```

I MOVED FROM 54 TO 36
FROM?
SCORES: YOU: 1 ME: 2



(c) Hartnell, 1982

THE

BUFFER

MICRO SHOP

(NEXT TO STREATHAM STATION)



NEW SOFTWARE SHOP EXCLUSIVELY FOR

ZX81

PROGRAMS, GAMES, "ADD/ONS"



MOST OF THE MAIL ORDER ITEMS ADVERTISED IN
THIS MAGAZINE AVAILABLE OVER THE COUNTER



LOADING PROBLEMS? TRY OUR INTERFACE
BUSINESS & TECHNICAL DATA HANDLING PROGS.
PROPER KEYBOARDS; CONSOLES; VDUS



374A STREATHAM HIGH ROAD,
LONDON SW16

Tel: 01- 769 2887

S.A.E. APPRECIATED FOR CATALOGUE

Microgame ZX81 Simulations (16K)

Soccer Supremo Run your favourite club in your own style, controlling game strategy, watching your team play other great sides in the Super League, transferring players, including star names, making boardroom decisions or delegating to solve business problems; improve facilities; spend gate money; lots of the fun and headaches of the soccer boss's lifestyle. Includes graphics.

Balance of Power As leader of a superpower you strive to maintain superiority of arms over a neighbouring country. The problem is that you and your enemy are mutually dependent on each other for raw materials. Can your economic, diplomatic and military judgements prevent a rapid slide towards nuclear war? Use threats, sanctions, force, tactical concessions etc.

Tycoon Start a company producing "widgets" and compete in the market against a computer controlled rival. Start small and build up your business or borrow money and start big. You have to make decisions about financing, staffing, factory space, machinery, pricing etc.

Battle of Britain As strategic commander of nine British fighter squadrons you must track and intercept the devious enemy bomber squadrons before they reach London. Micro acts as a flight control and communications centre for patrols, missions, intelligence reports etc. Sketch map provided. May also be played on any map of SE England with standard grid.

Asset Stripper Compete against your computer controlled arch-rival "KO Investments", capitalizing companies on the stock market and bidding for takeovers to gain control of lucrative assets. Can your micro really outwit you?

Kingdom of Nam As ruler of Nam you must control its economy; allocating labour; building cities, factories and ships; importing and exporting; negotiating pay claims and fighting the looming threats of inflation, strikes, starvation, over population and revolution. How long can you stay in power?

All programs 16K for 1 player.

£4.95 for 1/£8.90 any 2/£12.85:3/£16.80:4/£20.75:5

Please send cheque/PO to:

73 The Broadway, Grantchester, Cambridge CB3 9NQ



MOVING AHEAD
WITH
ZX SOFTWARE

ZX CHESS & ADVENTURES

PROGRAMS FOR THE ZX81/80 INCLUDING-

ZX CHESS I Very popular machine code program, with six levels of play and an analysis option. Unbeaten except by:
reduced to £6.50

ZX CHESS II A new improved version with a faster response time, seven levels of play, and in addition a recommended move option.
now only £12.99

ADVENTURES Exciting machine code games with instant response, choose from the range below. You find yourself stranded on an alien planet.
ADVENTURE 'A' £6.00

ADVENTURE 'B' Can you reach your ship and escape?
£7.00 In a jungle clearing you come across an Inca temple. You must break in, collect treasure and escape alive. Beware. Includes a cassette save routine.

ADVENTURE 'C' You are unfortunate enough to be drawn to an alien cruiser. Can you reach the control room and free yourself or will they get you first?
£8.00 Includes a cassette save routine.

GALAXY WARRIOR £3.00

Fast and exciting interactive animated graphics game.

Hunt Clingons and go through black holes...

1K GAMES PACK £6.00

and many more. For a catalogue giving full details, please send a S.A.E. to:

GALAXIANS All the features of the arcade game in a fast machine code program. Swooping attackers, explosions and personalised scoring.
£6.50

ZX BUG A 30 in 1 machine code tool and disassembler, allows access to all registers and to search through, and modify memory; with cassette routines.
£7.00



Artic Computing
396 James Reckitt Avenue
Hull HU8 0JA.



If you own a ZX80/ 81 then you need the ABACUS CONTROLLER

Developed to eliminate tedious swapping of plugs when LOADING or SAVING programs on cassette.

One switch operation allows selection of TALK, SAVE, CUE and LOAD modes. Using a built-in microphone/speaker to allow fast and reliable program naming and cueing.

Send cheque or P.O. for £12 including p&p to:



ABACUS ELECTRONICS
186 St. Helens Avenue
Swansea, W. Glam.
Tel: (0792) 50282



When the ZX-81 was first launched many experts refused to believe it was of any use for business applications. Mike Salem of Hilderbay Ltd set out to prove them wrong

THE SINCLAIR ZX-81 is widely-held to be a toy, not suitable for anything but games and learning to write programs. I will show that is not true at all. The ZX-81, when provided with sufficient memory, can do a wide variety of useful tasks. It is suitable, if provided with good software, for use by people with no previous experience of computing.

The minimum requirement for serious work is the ZX-81 plus at least 16K of RAM. The printer is extremely useful. A television set and tape recorder must, of course, be used. Such a configuration would have cost many tens of thousands of pounds a few years ago. The price has fallen dramatically but that does not detract from the capability of the machine. The ZX-81 and RAM cost slightly less than £100 plus VAT in January, 1982. Adding the printer and the 48K of memory increases the price to about £210.

The main limitations, compared to other microcomputers, are that the ZX-81 does not support data files, that the printer is rather basic, and that the keyboard is inconvenient to

use. Neither can it be expanded except to a limited extent.

Computer memory used to consist of vast arrays of tiny rings of a magnetic material, threaded painstakingly with fine wires. All that had to be done by hand, as it was not possible to design machines to do it. Each ring provided one bit of storage; 16K of core, as it was known, would involve threading two wires through each of about 130,000 rings—with no mistakes.

Computer programs were designed to use core as sparingly as possible. The bulk of the data being processed was stored on relatively simple and inexpensive media such as magnetic tape and, later, disc. Data was loaded into core as and when needed and dumped back to tape as soon as possible.

The ZX-81 does not allow data to be stored on and read from tape by a program—the whole program, with its data, may be loaded and stored later. Even if it were possible to use a data tape in that way, cassette tape is such an inconvenient medium for that kind of process that it would be scarcely practical. So the ZX-81 is



Turning your Sinclair ZX-81 into a business machine

limited, in practical terms, to what it can hold in memory at one time.

How serious is that? It depends on the particular application. Consider, for example, the payroll of a small company. A comprehensive program can be written to fit comfortably within 16K, with nothing omitted; in fact, a feature not to be found in payrolls on much more costly systems can be incorporated—gross pay and deductions can be worked out from the nett pay.

Room is left for full data on 30 employees to be held in RAM; there is no need for data files of any kind.

While that would not be suitable for a large company, it can save a small company doing payroll manually a great deal of unnecessary work. Another application is a what-if? type of program; a sheet of inter-dependent data is set up and then the consequences of changes are explored. For example, the effects on company profits of different assumptions about inflation can be assessed.

The width of the printed output is 32 characters; a kind of silver paper is used. The quality of the output is

surprisingly good—I was sceptical about the printer until we received one—and it reproduces very well on an office copier. All the information which can be printed on a wider printer can, if necessary, be re-formatted to use the 32-character width.

The ZX printer is not, of course, as good as a printer which costs more than the complete 48K ZX-81 system but it is a matter of inconvenience rather than impossibility. The graphics capability of the ZX printer is good.

The keyboard is perfectly usable, although slow and inconvenient. Keyboards of conventional type can be bought from independent suppliers for exceptionally reasonable prices.

It is very easy to plug disc drives and various interfaces into a computer such as an Apple II. The ZX-81 is very much more difficult to expand and interface. Nonetheless, many people are spending a great deal of effort on the problems and unbelievable products are appearing at unbelievably low prices.

The ZX-81 has a very good version

of the Basic language. Numeric information is handled well; text information is handled better than by most machines, including some in the more than £10,000 bracket. The machine is small, light and very robust; 16K of memory goes a long way, as will be seen when discussing possible applications; 48K is unbelievable.

There have been problems with the interconnection between the ZX-81 and the RAM pack—the machine would suddenly go ahead, losing all the contents of memory; those problems can be solved in an entirely satisfactory way. It is perfectly feasible to operate a ZX-81 for 24 hours a day.

The prime advantage is, however, the price.

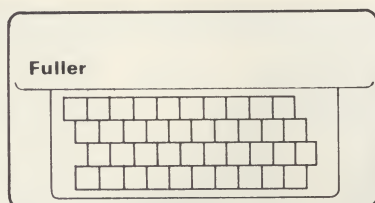
A ZX-81 with 48K of RAM can do virtually everything that a 48K Apple with printer but without discs can do—but compare the prices.

The price difference extends into the software field—compare the price and performance of a really good ZX-81 program to that of a similar program for a more expensive machine.

FULLER FD SYSTEM FOR ZX80/81

THE MOST VERSATILE SYSTEM FOR EXPANDING YOUR ZX

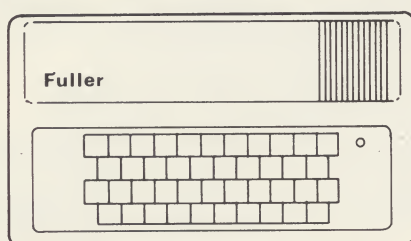
STANDARD KEYBOARD AND CASE



This splendid keyboard and case houses your ZX81 printed circuit board, which is simply screwed into place, the keyboard plugs into the ZX. You can now enter data with ease. The 40 key switch board is a custom unit not made up out of other manufacturers parts. The keytops are our own design and have the ZX Qwerty and functions foil printed onto them. Access to the user port, TV, MIC, and ear sockets are as per the ZX case.

Built keyboard and case £36.70 or £30.70 as a kit plus £2.10 postage and packing.

EXTENDED KEYBOARD AND CASE



The case is designed to house not only the keyboard and ZX but also our motherboard, power supply, RAM cards and two other boards, not necessarily of our manufacture. The injection moulded case measures 200 mm x 350 mm x 60 mm and houses a 42 keyswitch board, the extra keys can be assigned to other functions. The case is supplied with a "Power On" LED.

Built keyboard and case £39.95 or kit £33.95 plus £2.50 postage and packing. Motherboards £15.95 plus 80p postage and packing. 16k RAM board £35.95. 64k RAM board £79.95.

Keyboard Only Available!
Built £24.95
Kit £18.95 (+P.P. 80p)

Send SAE for details to:-

**FULLER MICRO SYSTEMS, The ZX Centre,
Sweeting Street, Liverpool 2.**

MICHAEL ORWIN'S ZX81 CASSETTES

CASSETTE ONE for 1K ZX81

"I had your Invaders React cassette . . . I was delighted with this first cassette."

**P. Rubython,
London NW10**

"I have been intending to write to you for some days to say how much I enjoy the games on 'Cassette One' which you supplied me with earlier this month. Please let . . . into the secret of your first time load every time!"

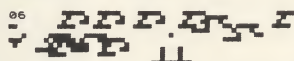
E.H., London SW4

Just two out of over 20 unsolicited testimonials.

INVADERS (1K)



PHANTOM ALIENS



BUG SPLAT



Cassette One 1K machine code programs:

React, Invaders, Phantom Aliens, Maze of Death, Planet Lander, Bouncing Letters, Bug Splat.

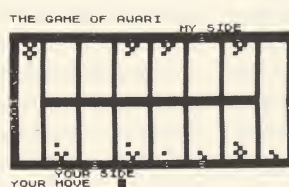
1K Basic Programs:

I Ching, Mastermind, Robots, Basic Hangman.
PLUS Large screen versions of Invaders and Maze of Death, ready for when you get 16K.

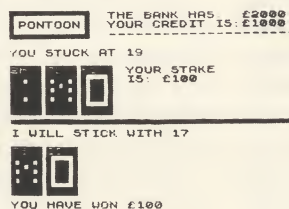
Cassette One costs £3.80.

CASSETTE TWO Ten games in Basic for 16K ZX81

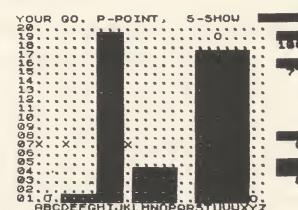
AWARI



PONTOON



RECTANGLES



PENNY SHOOT



Cassette Two contains Othello, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.
Cassette Two costs £5.

Recorded on quality cassettes, sent by first class post, from:
Michael Orwin, 26 Brownlow Road, Willesden, London NW10 9QL. (Mail order only please)



How to convert your ZX-80 programs to run on a ZX-81

A step by step guide by
Mark Charlton

LOOK QUICKLY through the listing of a program you want to convert. If there are no PEEKs and POKEs and you have more than 1K on your ZX-81, you are not likely to have many problems. The main difficulties in converting programs occur when there is POKEing to the screen, or when the ZX-80 program proves to be too long for the 1K ZX-81 when converted.

Despite that, most programs will run more smoothly on the ZX-81. PRINT AT and SLOW ensure that far more attractive displays are possible and the use of inverse graphics in PRINT lines can also enhance the display. Using INKEY\$ instead of INPUT A\$; pressing NEWLINE also makes things work in a much more satisfactory way.

If you look through the program before you enter it and see there are no PEEKs and POKEs, you should make a few changes on the listing before turning-on your computer. Change the way the random numbers are generated, for a start:

```
ZX-80
LET X=RND(10)
```

```
ZX-81 LET X=INT(RND*10)+1
```

You may be able to save a line when you see the following in a ZX-80 program:

```
LET X=RND(10)
IF X=5 THEN PRINT "FIVE"
```

The ZX-81 version could well be IF RND greater than or equal to .9 THEN PRINT "FIVE".

After changing the random numbers—and realising, of course,



(continued on page 44)





(continued from page 43)

that RAND on the ZX-81 is equal to the ZX-80 RANDOMISE—look for any use of TL\$ (truncate left) in the ZX-80 program.

The ZX-81 equivalent of this very useful ZX command is A\$ (2 TO). That is, if the ZX-80 program says:

```
LET A$="HELLO"
10 LET A$="HELLO"
20 PRINT A$
30 LET A$=TL$(A$)
40 IF A$ greater than "" THEN GOTO 20
50 PRINT "GOODBYE"
You should rewrite it to read:
10 LET A$="HELLO"
20 PRINT A$
30 LET A$=A$(2 TO)
40 IF A$ greater than "" THEN GOTO 20
50 PRINT GOODBYE
```

In both cases, the output of the program will be:

```
HELLO
ELLO
LLO
LO
O
GOODBYE
```

The ZX-80 lacks the facility to deal with floating point arithmetic, so it truncates a number automatically. The INT function should be used before any division in a ZX-80 program listing when entering it into

the ZX-81. You may find that you would prefer the computer to round the figure to the nearest whole number, rather than to the lower whole number.

Here is a small program on the ZX-81 to show that the INT function does not 'round' to the nearest number but just to the nearest lower whole number:

```
10 INPUT A
20 LPRINT A,INT A
30 GOTO 10

1      1
1.4    1
1.7    1
1.99   1
```

The output shows the numbers entered (1, 1.4, 1.7 and 1.99) and what happened to them. You need to add .5 to the numbers entered if you want rounding-up, as the following example shows, when entering the same initial four values:

```
10 INPUT A
20 LPRINT A,
30 LPRINT INT (A+.5)
40 GOTO 10

1      1
1.4    2
1.7    2
1.99   2
```

Certain functions on the ZX-81—PRINT AT, PLOT and TAB—'INT' a number automatically, so work out which value—the nearest whole number or the lower whole number—to which you would like them to be INTed.

If you have a program which stores information in and retrieves information from REM statements, you can convert them easily by keeping in mind that the first address after the word REM in the first line of a ZX-80 program is 16427, while the equivalent address on the ZX-81 is 16514. Here is a list, produced by the hard-working ZX-81, of ZX-80 (first) addresses for PEEK/POKE REM work and the equivalent on the ZX-81:

ZX80		ZX81
16426	<->	16513
16427	<->	16514
16428	<->	16515
16429	<->	16516
16430	<->	16517
16431	<->	16518
16432	<->	16519
16433	<->	16520
16434	<->	16521
16435	<->	16522
16436	<->	16523
16437	<->	16524
16438	<->	16525
16439	<->	16526
16440	<->	16527
16441	<->	16528
16442	<->	16529
16443	<->	16530
16444	<->	16531
16445	<->	16532
16446	<->	16533
16447	<->	16534
16448	<->	16535
16449	<->	16536
16450	<->	16537
16451	<->	16538
16452	<->	16539
16453	<->	16540
16454	<->	16541
16455	<->	16542
16456	<->	16543
16457	<->	16544

You are probably aware that all graphics symbols, letters and numbers, and their inverses, are available directly from the keyboard on the ZX-81. That was not so on the ZX-80 and, depending on the listing, you will find either a great number of things like PRINT CHR\$(128) to print an inverse space, or that the listing draws-in the required charac-



ter or refers to the graphic on a particular key.

If the specific key is referred to, use this table to convert, keeping in mind that the first reference is to the ZX-80 keyboard, the second to the ZX-81: shift Q, graphic 5; shift W, graphic 6; shift E, graphic 1; shift R, graphic 2; shift T, graphic D; shift A, graphic A; shift S, graphic T; shift D, graphic 4; shift F, graphic 3; shift 6, graphic S.

Here are the graphics symbols available on the ZX-80, with their character numbers and codes. Use this table when you find a reference to, say, PRINT CHR\$(137) in a ZX-80 listing:

moving display routine are generally greatly improved on the ZX-81. You will find it necessary to delete the whole of the moving display, changing it to PAUSE—jerky, but the only thing possible on a new-ROM ZX-80, unless you have added a SLOW—or to a delay loop—FOR J = 1 TO 20 NEXT J—or just leaving it as it is. You can obtain some indication as to which figure to place after the word PAUSE by keeping in mind that the figure used in most ZX-80 moving-display routines to POKE 16414 is related inversely to the delay—that is, the larger the number, up to 255, the shorter the time the display is held on the ZX-80.

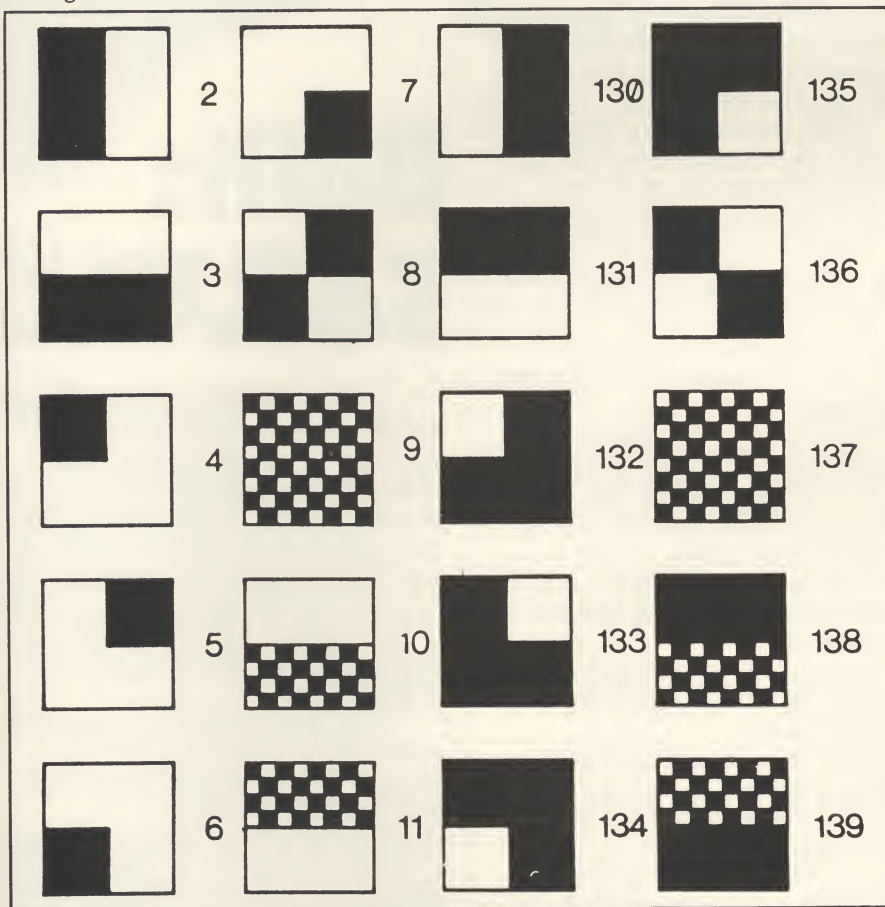
down from the top of the screen, X is the count across. You may well prefer to use PRINT AT, which produces more or less the same result. Not all system variables are so convenient. Here is a list of them, showing the ZX-80 and Zx-81 equivalents. The list was compiled by Toni Baker:

Old ROM	New ROM
16384	16384
16385	16385
16386	16391
16387	16392
16388	no equivalent
16389	no equivalent
16390	16394
16391	16395
16392	16400
16393	16401
16394	16404
16395	16405
16396	16396
16397	16397
16398	no equivalent
16399	no equivalent
16400	16412
16401	16413
16402	16418
16403	16419
16404	16420
16405	16408
16406	16409
16407	16427
16408	16428
16409	16429
16410	16432
16411	16433
16412	16434
16413	16435
16414	16436
16415	16437
16416	no equivalent
16417	no equivalent
16418	no equivalent
16419	no equivalent
16420	no equivalent
16421	no equivalent
16422	16406
16423	16407
16424	16509
16425	16510
16426	16513
16427	16514

To sum up, here is what you do:

ZX-80	ZX-81
LET A=RND(9)	LET A=INT(RND*9)+1
LET A\$=TL\$(A\$)	LET A\$=A\$(2 TO)
Moving graphics: POKE 16414, n	PAUSE 255-n (very approximate)
Variables -----	see table
Graphics -----	see relevant table, two given
LET A=C/B	LET A=INT(C/B) or LET A=INT(C/B+.5)
INPUT A	LET A=CODE (INKEY\$)-28

Good converting.



You may find that the appearance of the program when running will be greatly improved if you use PRINT AT rather than CLS. Experiment with display formats to see if you can dispense with use of CLS. The SCROLL command is very useful for printout of tables.

ZX-80 programs which use a

Many ZX-80 programs use the following line to POKE a character into a specific position on the screen:
POKE Y*33 + X + 1 + PEEK (16396) + PEEK (16397)*256, n

Wonder of wonders, this still works on the ZX-81 adjusting itself automatically to accommodate changes in programs. Y is the count-

Sinclair ZX81 Personal Computer the heart of a system that grows with you.

1980 saw a genuine breakthrough – the Sinclair ZX80, world's first complete personal computer for under £100. Not surprisingly, over 50,000 were sold.

In March 1981, the Sinclair lead increased dramatically. For just £69.95 the Sinclair ZX81 offers even more advanced facilities at an even lower price. Initially, even we were surprised by the demand – over 50,000 in the first 3 months!

Today, the Sinclair ZX81 is the heart of a computer system. You can add 16-times more memory with the ZX RAM pack. The ZX Printer offers an unbeatable combination of performance and price. And the ZX Software library is growing every day.

Lower price: higher capability

With the ZX81, it's still very simple to teach yourself computing, but the ZX81 packs even greater working capability than the ZX80.

It uses the same micro-processor, but incorporates a new, more powerful 8K BASIC ROM – the 'trained intelligence' of the computer. This chip works in decimals, handles logs and trig, allows you to plot graphs, and builds up animated displays.

And the ZX81 incorporates other operation refinements – the facility to load and save named programs on cassette, for example, and to drive the new ZX Printer.



New BASIC manual

Every ZX81 comes with a comprehensive, specially-written manual – a complete course in BASIC programming, from first principles to complex programs.

Kit: £49.⁹⁵

Higher specification, lower price – how's it done?

Quite simply, by design. The ZX80 reduced the chips in a working computer from 40 or so, to 21. The ZX81 reduces the 21 to 4!

The secret lies in a totally new master chip. Designed by Sinclair and custom-built in Britain, this unique chip replaces 18 chips from the ZX80!

New, improved specification

- Z80A micro-processor – new faster version of the famous Z80 chip, widely recognised as the best ever made.
- Unique 'one-touch' key word entry: the ZX81 eliminates a great deal of tiresome typing. Key words (RUN, LIST, PRINT, etc.) have their own single-key entry.
- Unique syntax-check and report codes identify programming errors immediately.
- Full range of mathematical and scientific functions accurate to eight decimal places.
- Graph-drawing and animated-display facilities.
- Multi-dimensional string and numerical arrays.
- Up to 26 FOR/NEXT loops.
- Randomise function – useful for games as well as serious applications.
- Cassette LOAD and SAVE with named programs.
- 1K-byte RAM expandable to 16K bytes with Sinclair RAM pack.
- Able to drive the new Sinclair printer.
- Advanced 4-chip design: micro-processor, ROM, RAM, plus master chip – unique, custom-built chip replacing 18 ZX80 chips.



Built: £69.⁹⁵

Kit or built – it's up to you!

You'll be surprised how easy the ZX81 kit is to build: just four chips to assemble (plus, of course the other discrete components) – a few hours' work with a fine-tipped soldering iron. And you may already have a suitable mains adaptor – 600 mA at 9 V DC nominal unregulated (supplied with built version).

Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.



puter-



16K-byte RAM pack for massive add-on memory.

Designed as a complete module to fit your Sinclair ZX80 or ZX81, the RAM pack simply plugs into the existing expansion port at the rear of the computer to multiply your data/program storage by 16!

Use it for long and complex programs or as a personal database. Yet it costs as little as half the price of competitive additional memory.

With the RAM pack, you can also run some of the more sophisticated ZX Software – the Business & Household management systems for example.

Available now- the ZX Printer for only £49.⁹⁵

Designed exclusively for use with the ZX81 (and ZX80 with 8K BASIC ROM), the printer offers full alpha-numerics and highly sophisticated graphics.

A special feature is COPY, which prints out exactly what is on the whole TV screen without the need for further instructions.

At last you can have a hard copy of your program listings – particularly useful when writing or editing programs.

And of course you can print out your results for permanent records or sending to a friend.

Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your computer – using a stackable connector so you can plug in a RAM pack as well. A roll of paper (65 ft long x 4 in wide) is supplied, along with full instructions.

How to order your ZX81

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day.

BY FREEPOST – use the no-stamp-needed coupon below. You can pay

by cheque, postal order, Access, Barclaycard or Trustcard.

EITHER WAY – please allow up to 28 days for delivery. And there's a 14-day money-back option. We want you to be satisfied beyond doubt – and we have no doubt that you will be.

To: Sinclair Research, FREEPOST, Camberley, Surrey, GU15 3BR.

Qty	Item	Code	Item price £	Total £
	Sinclair ZX81 Personal Computer kit(s). Price includes ZX81 BASIC manual, excludes mains adaptor.	12	49.95	
	Ready-assembled Sinclair ZX81 Personal Computer(s). Price includes ZX81 BASIC manual and mains adaptor.	11	69.95	
	Mains Adaptor(s) (600 mA at 9 V DC nominal unregulated).	10	8.95	
	16K-BYTE RAM pack.	18	49.95	
	Sinclair ZX Printer.	27	49.95	
	8K BASIC ROM to fit ZX80.	17	19.95	
	Post and Packing.			2.95

☐ Please tick if you require a VAT receipt

TOTAL £

*I enclose a cheque/postal order payable to Sinclair Research Ltd, for £

*Please charge to my Access/Barclaycard/Trustcard account no.

*Please delete/complete as applicable.

Please print.

Name: Mr/Mrs/Miss

Address:

FREEPOST – no stamp needed.

SUS 04

sinclair ZX81

6 Kings Parade, Cambridge, Cambs., CB2 1SN.
Tel: (0276) 66104 & 21282.



ONCE YOU have your ZX-81, have set it up and worked your way through the manual provided, the obvious question arises—Where do I go from here?

For the Sinclair book, good of its kind, is still only a manufacturer's manual—a guide to the capabilities of the product. It will tell how to do things but is not concerned particularly with why the techniques it describes are useful, nor the best way of attacking a practical program, whether for household accounts or a game.

Do not worry. Publishers are falling over each other to produce books which will aim, with varying degrees of success, to provide the answer for which the new ZX-81 owner is looking.

In the U.K. there are at least 15 manuals generally-available for owners of all levels of experience and fields of interest, with new titles appearing almost weekly. That is at least comforting but it raises another problem, that of which to choose. The answer can really be provided by deciding the purpose for which you bought the machine in the first place.

The machine is just a tool. It is how you use it that counts—for enjoyment, for work or for education. The authors and publishers have had somewhat the same problems of trying to decide what information the ZX-81 user might want and how best to impart it.

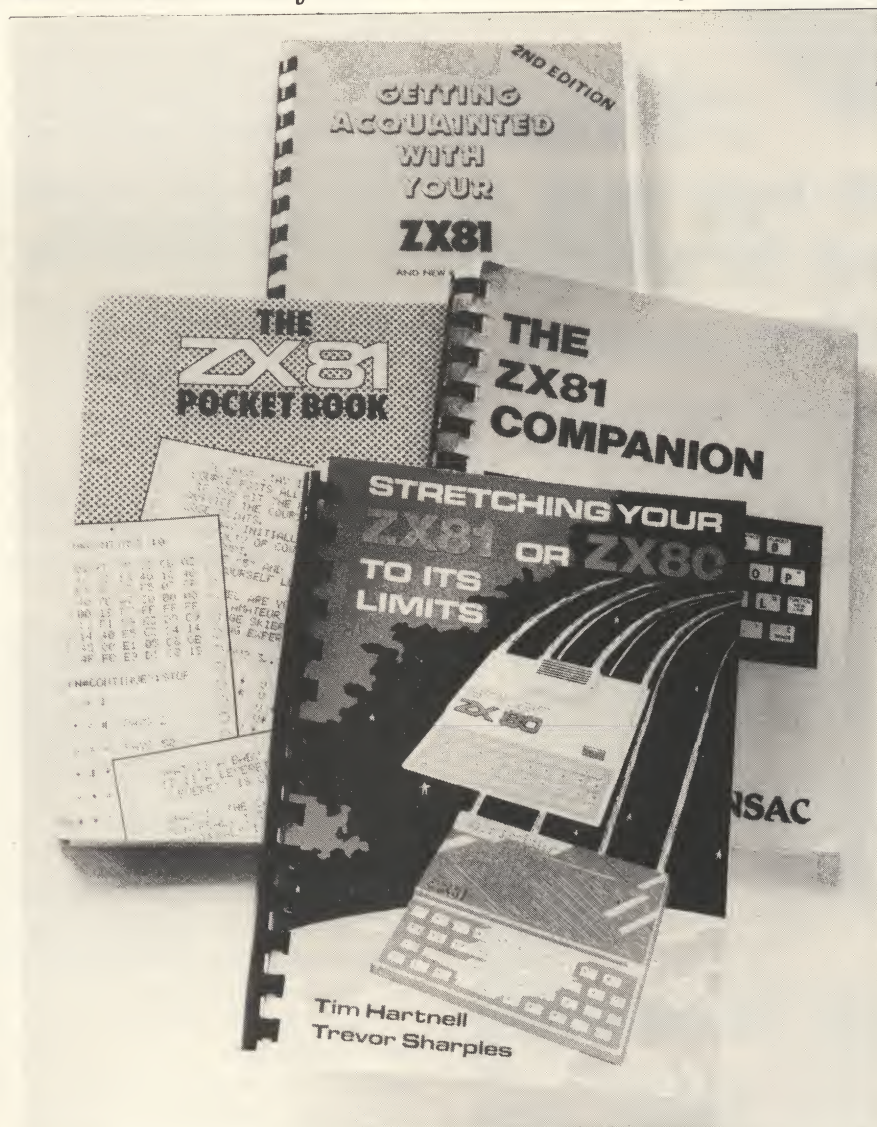
The approaches generally can be divided into two—that the whole thing should be fun and that the reader should be taught or shown the techniques he needs to know for what he wants to do. Both frequently then leave you to get on with it.

Both are fair enough. The programming techniques learned in computer games are just as applicable to writing a household accounts program as those designed specifically to do so.

We aim to provide a rough guide to the books available, so that you can choose the approach to suit you. All the books assume that the reader has read the manual. Some may say that is not the case but all have to

Starting to get acquainted with the Sinclair book world

Since the dawning of the ZX-80, hundreds of thousands of words have been written about it and its successor. Each month we will examine some of those words to see if they are of value to users. By Ron Coates.



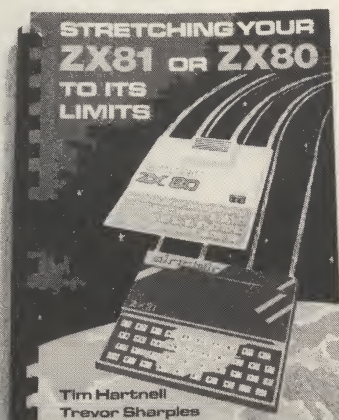
rely at one point or another on various pieces of information and the explanations in it.

That probably is unavoidable, for if any manual or book tried to explain all its terms and usages in comprehensive detail, it would be long, boring, tedious and, worst of all, very expensive.

The game approach to teaching computer programming has a long history. Many big computer companies and universities discovered that one of the best ways of teaching programming was for the students to design their own games and run them on a machine.

It was regarded by the teachers and students as a painless way of learning how to make the machine work and do what was required of it. When you think that the alternative was to read a number of manuals and then write programs to work out the VAT on any quantity of widgets,

explains what has happened. Through the book games of greater complexity are listed, most to



demonstrate a programming technique or facility of the machine—tricks with the screen, specialised functions in mathematics and so on.

His other book, *Making the most of your ZX-80 and Stretching your ZX-81 or ZX-80* are continuations of increasing complexity and I found that stretching referred more to me than it really did to the computer.

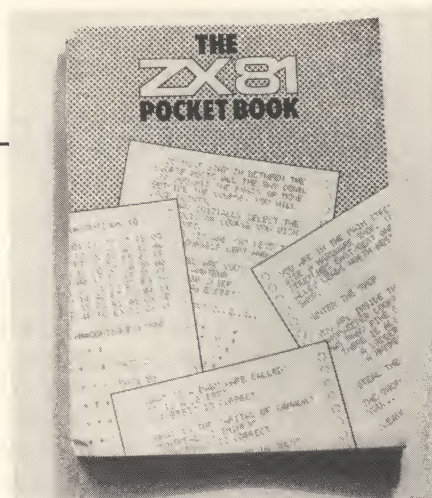
The good point is that Hartnell makes the effort to make learning a pleasure and pushes the reader quickly to a point of confidence in programming ability and the ZX-81.

The techniques and uses of the machine are indicated very well by the example programs. The disadvantages are that the books are all revisions of books for the ZX-80 and Hartnell has had neither the time nor resources to make it clear which listings of programs are for which machine.

His explanations are terse, occasionally to the verge of incomprehensibility, but he never says anything without reason and you can generally grasp the point with a little thought.

That may sound damning but on the whole the books are to be recommended because of the successful effort Hartnell has put into judging the level of information he presents in each.

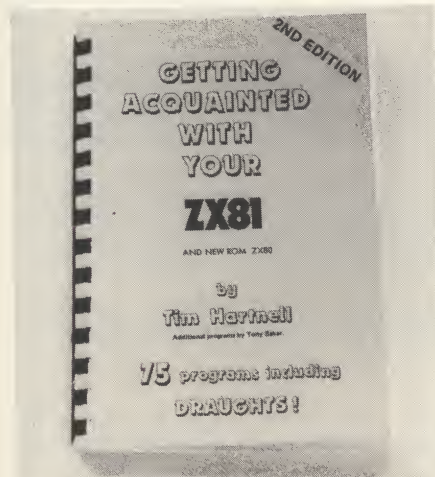
A book which tries to cover much the same ground is *The ZX81 Pocket Book* by Trevor Toms. The author



has made an effort to extend his explanation—for instance each line of programming code is explained if it is novel—and to do more than provide a series of listings to type into the machine.

It is not really for the absolute beginner but embraces most of the techniques dealt with by Hartnell's three books. Readers will probably find his explanations easier to follow, because of his step-by-step notation.

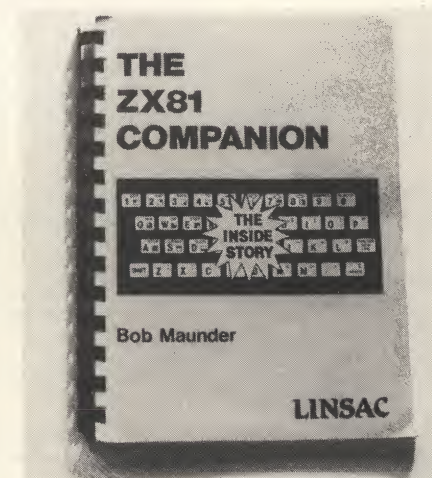
For the person who wishes to take the ZX-81 really seriously, *The*



you can see why it became popular; it also worked.

That is the approach followed by one of the pioneer ZX-80 writers, Tim Hartnell, who has a number of titles to his credit of scaled degrees of difficulty. *Getting acquainted with your ZX-81* starts at the lowest level.

It aims to have the reader start using the machine as soon as it can be hooked to the television. The explanatory text is held to a bare minimum, as are the other books. There is a page-and-a-half of introduction and Hartnell then expects you to key-in the first game to see how it works and enjoy it. Then he



ZX-81 Companion is one of the better books. It is different in concept from the others reviewed. The author is an academic and his style, while not heavy-handed, shows it. Programs and examples are presented clearly but he is obviously addressing himself to the ZX-81 owner who wants to move as quickly as possible from the manual to using the machine for teaching, business or household accounting.

Next month we will look at more serious books and the delightful *Peek, Poke, Byte and Ram*.

3rd ZX MICROFAIR



CENTRAL HALL WESTMINSTER LONDON SW1
FRIDAY 30th APRIL 1982 (12.30-8.30 pm)
SATURDAY 1st MAY 1982 (10.00-6.00 pm)

— EVERYTHING FOR THE ZX80/81 —

Dozens of hardware add-ons and hundreds of programs to suit all tastes AND books, mags, user groups and lots of new products. Buy or just browse.

STILL THE BIGGEST SELECTION ANYWHERE

Bring and Buy Sale for micros/add-ons/software
Buffet for Refreshments
Showguide with full details of suppliers and products

LOW PRICE ADMISSION: Adults, 60p. Under 14, 40p.
(accompanied children under 10 FREE)

ADVANCE TICKETS (Friday 30th April only): Adults £1.
(cheques payable to ZX Microfair) Children 50p.

Organiser: Mike Johnston, 71 Park Lane, Tottenham,
London N17 0HG.

IF YOU HAVE AN INTERESTING PRODUCT YOU WOULD
LIKE TO SHOW AT THE ZX MICROFAIR, PLEASE
CONTACT THE ORGANISER

COMPUTACALC ZX

FAMILY BUDGET FIGURES											
1	2	3	4	5	6	7	8	9	10	11	12
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20											
21											
22											
23											
24											
25											
26											
27											
28											
29											
30											
31											
32											
33											
34											
35											
36											
37											
38											
39											
40											
41											
42											
43											
44											
45											
46											
47											
48											
49											
50											
51											
52											
53											
54											
55											
56											
57											
58											
59											
60											
61											
62											
63											
64											
65											
66											
67											
68											
69											
70											
71											
72											
73											
74											
75											
76											
77											
78											
79											
80											
81											
82											
83											
84											
85											
86											
87											
88											
89											
90											
91											
92											
93											
94											
95											
96											
97											
98											
99											
100											

An advanced spreadsheet program for the Sinclair ZX81 with 16K RAM.

This versatile software allows manipulation and inspection of data in the most convenient way ever. Ideal for financial planning, personal budgeting, cashflow analysis and countless other business, home, scientific and technical applications.

The screen acts as a window on a much larger grid (up to 38 x 38) of titles and numbers (up to 9 digits). Change one number or formula and all dependant results change automatically. Save on tape or printout for a permanent record.

Tasks that would take hours with pencil, paper and calculator can be performed in seconds with COMPUTACALC ZX.

For cassette and full documentation send £7.95 to: Silicon Tricks, Dept. S1, 2-4 Chichester Rents, London WC2 1EJ. (Tel: 01-602 6074).

Silicon Tricks

BARGAIN BYTES

FOR THE 16K ZX81

UNBEATABLE VALUE!

CASSETTE OF 8 PROGRAMS (50K+)

For fun and fortune – no programming knowledge needed!

ONLY £5

DEEP SEA ADVENTURE (14K) Discover the treasure chest before you run out of gold or strength. Levels of play from "difficult" to "downright impossible". Also has "Save Game" feature.

BANK ACCOUNT (13½K) Invaluable for controlling your finances. Produces detailed statements and can also keep track of credit card spending.

UNDERGROUND ADVENTURE (6½K) Battle against monsters and obstacles underground. A very difficult and challenging task.

DEPTHCHARGE (2½K) A skillful moving graphics game. Fire your depthcharges to blow up enemy submarines before they destroy your ship.

HANGMAN (11½K) The old family game based on a library of 500 words. Excellent graphics.

LOAN (2½K) Calculates repayments, time, sum borrowed or interest. For Bank Loans or Mortgages.

CODEBREAKER (2K) You have ten guesses at the four digit number held by the computer.

FOREIGN CURRENCY (3K) How many dollars is £110? How many Francs is \$38? See what your money will buy around the world!

ORDER NOW!

For convenience simply quote SU4 and your name and address on the reverse of your cheque/postal order, and your software (on TDK cassette) will then be despatched, first class post, complete with comprehensive instructions.

Send to: Richard Shepherd, 22 Green Leys,
Maidenhead, Berkshire SL6 7EZ
Telephone: (0628) 21107

LEISURE GAMES

Professional Software for Hobby Computers

THE KEYS OF GONDRUN

A journey beneath the Enchanted Forest in search of the missing keys of Gondrun the Wizard. Can you discover the keys – and stay alive? With real-time monster fights (6 skill levels), save on cassette feature and alternative responses to give a different game every time. Map the caves as you travel through them, but beware of the Two-Headed Throna, the Jubjaroo and the other nasties which are lurking. A great game occupying the full 16K RAM.

PACK CONTAINS TAPE & INSTRUCTIONS Only £5.50

POP STAR

Would you like to be rich and famous? This program won't guarantee that, but it's great fun all the same. Will your records be hits? Can you negotiate a better royalty rate and increase your income? Maybe you'll be offered a TV series or film. But it isn't an easy life and troubles, like flop records, the taxman and other horrors are always waiting. And if you decide to bribe and cheat – then don't get caught! In this game you could make a million – or you could end up broke. It's up to you. Requires 16K RAM.

PACK CONTAINS TAPE & INSTRUCTIONS Only £5.50

SPECIAL OFFER

Both tapes supplied together for just £10.00

We may have other games ready by the time you read this. S.A.E. for details.

All our prices include UK postage. European customers please add 20p per tape, elsewhere please add 50p per tape.

MAIL ORDER ONLY

LEISURE GAMES

3 Spring Rise, High Crompton, Shaw, Oldham, Lancs.



Sorting the diamonds from the glass

Phil Garratt scratches the surface of the vast number of products on the market

NO OVERVIEW of software for the Sinclair computers can hope to do more than scratch the surface of an enormous range of products now available. There are many gems among them and one or two which barely make it into the glass category. When my ZX-80 arrived nearly two years ago, it was difficult to find it mentioned in the microcomputer magazines, let alone any software. Now there are hundreds of programs available and

almost as many micro magazines.

The earliest ZX-80 offerings were fairly routine—*Mastermind*, *Simon*, *Nim*. Ken MacDonald's *Amazing Active Display*, a machine code pause routine, however, showed that there was more to the ZX-80 than met the eye.

Shortly after, the first "flicker-free" games for the ZX-80 appeared, using software in exactly the way that the ZX-81 uses hardware, splitting the Z-80 microprocessor time

between keeping on the display and following the program instructions.

MacDonald produced his "flicker-free" if rather eye-numbing *Break-out*, and John Edmonds produced a limited but recognisable *Space Invaders*. He also invented *Galaxy Wars* which, if I had no other reason, is sufficient on its own for me never to want to part with my ZX-80. It is far and away the most original and compulsive game I have either for the 80 or the 81.

Another major achievement in ZX-80 software was Philip Joy's chess program, which appeared in early 1981. Although its standard of play could perhaps best be described as "not illegal", it showed that the ZX-80 had a potential to match computers costing five times as much.

Then the ZX-81 was announced. By the time the public could obtain either the new machine or the new ROM for the ZX-80, there was already a number of books and programs available, because of the Sinclair "seeding" of some authors with machines. Sinclair introduced a range of inexpensive software, which was good at the time, though fairly routine. Its failure to add to the range in a year is a great pity.

As I indicated initially, all I can do is to try to deal with some of the ZX-81 programs available, which I will split into three groups—arcade games, other games and utilities. I have to omit any discussion of business-orientated packages as they are outside my field but it must be said that Hilderbay, with its range which includes a payroll system, is doing a marvellous public relations job for the rest of us—by showing that the Sinclair is sufficiently powerful to have a serious side.

I am also omitting household programs such as *Bank Account* and *Telephone Directory*. Although those programs are useful when trying to justify a home computer to sceptics, the ZX-81 takes too long to save and load to make them worthwhile. Now if we had discs—but that is another story.

(continued on page 52)





(continued from page 51)

So to arcade games, the most famous of which is *Space Invaders*, and the Macronics version for the 1K ZX-81 is good for the time when your 10 pence pieces run out. Incidentally, Macronics provides a listing with each cassette and it would be pleasant if other companies followed suit.

The program is a smaller version of the real thing—you have only one laser base per game and only the current and last game scores are displayed—i.e., no highest score feature. I had reservations at first but I soon became addicted, as did all the children to whom I showed it at Christmas.

They added their own sound effects of the Pchow! and Wham! variety but if I had had the necessary hardware, that would not have been required for the next two programs, Quicksilva's *Defender* and *Asteroids*. The first involves running a gauntlet of invaders coming at you from the right, while moving your ship up and down, faster and slower, trying to fire while avoiding their missiles and all the time watching the ground rush past below.

The program is remarkable in two respects. First, it includes software to drive an add-on sound generator available from Quicksilva and, although it is not cheap, it adds a new dimension to games. Second, the display uses the entire height of the TV screen—not just the portion of it addressed by the ZX-81.

Asteroids does not use the entire screen but has the sound-generating instructions. Your ship is a number on the screen, which represents the direction of movement or fire, e.g., O equals up, Z equals right, and the like. The larger asteroids disintegrate in a satisfying manner and more and more appear as the game progresses. Once you are used to not having an arrow to show the direction of your ship, it becomes a good game.

The last arcade game at which I look as is DKtronics *Centipede*. I cannot describe it adequately without confusing all and sundry, so suffice to say it has excellent moving



graphics and is very attractively presented, with the game becoming progressively more difficult in several ways.

What is also very creditable about it is that the player can decide at the start how many bases each game should have and how fast the game should run. That means that several people can play at the same level of difficulty and the program produces a high score league table.

Moving to non-arcade games, a number of "adventures" are available and one of the major factors in determining the appeal of an adventure is the number of situations involved in the game. That means that machine code games such as the

two Artic Computing Adventures have a big advantage over programs using Basic.

The Adventure A seems the easier of the two but Adventure B will give you a score—if you score anything—although it is much fussier about which words it will accept in each situation.

Both require plenty of time and patience, whereas the Macronic *Nightmare Park* is usually finished quickly. It is really eight or 10 simple Basic programs, such as *Number Guessing* and *Simon*, all joined neatly together, and which you go through at random as you try to cross the

(continued on page 53)





(continued from page 52)

park. This well-presented game kept the children quiet for hours, too.

A number of ZX-81 versions of the classic *Star Trek* are available—all, if anything, better than the original mainframe program. I showed the game to an 11-year-old and her comment, "Gee, it takes a million years to kill a single Klingon" is a slight exaggeration, although it is true that a game can take two hours.

I have two versions of the game, one by Macronics, which makes good use of graphics, although entering of commands has to be done carefully, and the other by Silversoft which, although a trifle slower, is better-presented.

Several chess programs exist, although the only one I have is Artic ZX chess. It plays an impressive game on six levels, the first three levels responding in less than 10 seconds, 40 seconds and five

minutes respectively. Every level plays good chess but tends to lack an end-game strategy. Recently I have seen the latest version of the program, which has minor bugs corrected, although the input has been made a little more complicated.

In addition, the level one time has been reduced from 10 to two seconds and the others speeded accordingly.

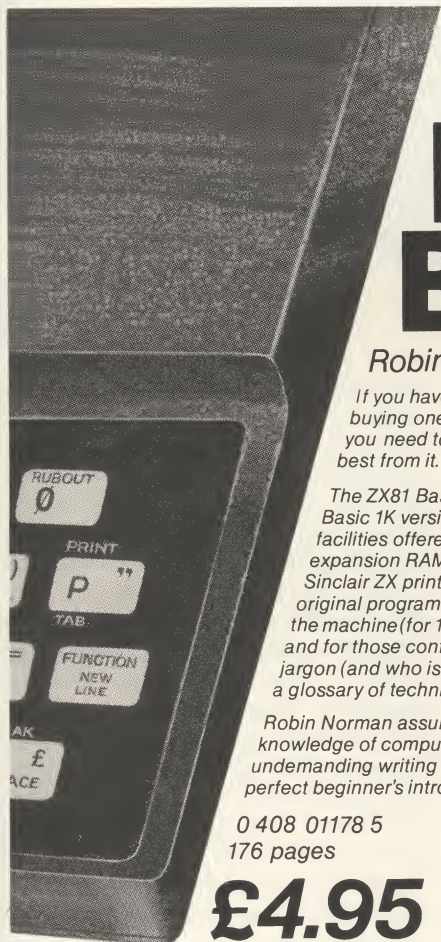
Now for the utilities, which are programs to help you write programs.

The best I have seen is Bug-Bytes ZXAS assembler. It allows you to enter standard Z-80 mnemonic codes, e.g., LD HL. (16396), in REM statements, which are assembled and then placed wherever you want in memory.

It seems that many ZX-81 users are interested in machine code; the assembler makes learning and using it a hundred times easier.

Bug-Bytes also sells a disassembler, which can be used at the same time as ZXAS, and which can produce memories from machine code—e.g., the ROM—plus other facilities. The last program which I have not seen yet is ZX-MC from Picturesque, which apparently allows double-speed loading and saving of any part of the memory, among other things.

I have mentioned fewer programs than I would like and in less detail than I would like. The best thing is to see the programs run before you buy, as more and more are now available in shops. Watch for the 'cowboys' who are selling programs extracted from magazines but, in general, ZX software is good value, often providing displays and routines I would not have thought possible, and cheaper than similar programs for other computers on the market.



ZX81 Basic Book

Robin Norman

If you have a ZX81, or are thinking of buying one, this book will tell you all you need to know to get the best from it.

The ZX81 Basic book covers the Basic 1K version, the additional facilities offered by the 16K expansion RAM and how to use the Sinclair ZX printer. There are 14 original programs for you to run on the machine (for 1K and 16K versions), and for those confused by computer jargon (and who isn't?) there is a glossary of technical terms.

Robin Norman assumes no initial knowledge of computing and his undemanding writing style is a perfect beginner's introduction.

0 408 01178 5
176 pages

£4.95

(SU. 4/5/82)

Learning BASIC with your Sinclair ZX80

Robin Norman

This book will be of great value to all ZX80 owners. It tells you how to get the ZX80 working, how to program it and how to get the best out of it. Contains all the information necessary to use the Sinclair ZX80 to the full plus 14 specially written programs unavailable elsewhere.

0 408 01101 7 160 pages

£4.50

Q&A on Personal Computing

Peter Lafferty

This book will help anyone who wishes to learn about personal computers and the uses to which they can be put. It describes the development of the personal computer, explains its operation and outlines the principles of programming. A chapter on applications surveys the many uses of these remarkable machines.

0 408 00555 6 96 pages

£1.95

Microprocessors for Hobbyists

Ray Coles

Adapted from a popular series of articles in *Practical Electronics*, this book takes the reader step by step through the mysteries of the microprocessor chip and its instruction set, the support components such as memories and communication interfaces, and the use of the microprocessor in home computers.

0 408 00414 2 92 pages

£3.95

Coming shortly...

26 BASIC Programs for your Micro

Derrick Daines

Here is a collection of 26 new and varied games programs, from spelling tests to submarine-hunting. They are graded from the most elementary, usable on the simplest home computer, to longer and more complex programs suitable for more advanced machines.

Derrick Daines has written the games in an easy subset of BASIC so that the reader will have no difficulty in translating them for any microcomputer. Each program is described in a lively and informative style, with a list of variables and memory size required, plus a program listing and sample run.

The book is ideal for hobbyists since it helps improve techniques for writing successful programs whilst also providing plenty of entertainment.

ORDER NOW—from your local bookseller

In case of difficulty send cash with order to Patricia Davies, Marketing Manager at the address shown

Newnes Technical Books
Borough Green, Sevenoaks, Kent TN15 8PH

A division of Butterworths

Get the most from your Sinclair—or your Atom or Vic-by investing in some of the best books available...

Getting Acquainted with your ZX-81—Tim Hartnell. More than 80 great programs in this 128-page book, including *Zombies*, *Life*, *Micro-Mouse*, *Word Processor*—to use with the printer—and *DRAUGHTS*. This is the number one U.K. ZX-81 book and is designed to get your ZX-81 up and running with worthwhile programs from day one. ZX-81 commands are explained, with programs to show them in action; there is a chapter on how to make the most of the standard 1K memory and much more. *Computing Today* said:

"This book... gives you the basis of a hands-on program... it is easy to read... has something for everyone... the practical approach used can only benefit the growing body of users".

In the U.S., *Creative Computing* said: "The book is chock full of games, such as *Checkers*, which draws the entire board on the screen... As you work your way through it, your program library will grow along with your understanding of Basic".

Tim Hartnell is head of the National ZX-80 and ZX-81 Users' Club and has used the feedback from hundreds of members to create the most suitable book for the ZX-81 user. **Getting Acquainted with your ZX-81** by Tim Hartnell is £5.95, plus 70p p. & p.

The Gateway Guide to the ZX-81 and ZX-80—Mark Charlton. This 180-page book contains more than 70 fully-documented and explained programs for the ZX-81 and ZX-80. The book is a "doing" book rather than a reading one and the author encourages the reader to try things as he or she goes. *Creative Computing* said:

"The book starts at a low level and assumes the ZX-80 or ZX-81 is the reader's first computer. By the end, the reader will have become quite proficient".

The book describes each function and statement in turn, illustrates it in a demonstration routine or program, and then combines it with previously-discussed material. **The Gateway Guide to the ZX-81 and ZX-80** by Mark Charlton is £6.45, plus 70p p. & p.

Mastering Machine Code on your ZX-81 or ZX-80—Tony Baker.

This great book, the best-selling U.K. volume on the machine code for the ZX-81, has been warmly-welcomed by the computer press and users. *Practical Computing*, in a review on Prestel, said: "Have worked through three chapters so far and it's remarkable. If the rest is as good I expect to be able to do some quite clever things quite soon. It does need concentration but compared to some articles I've read on the same topic its 'Janet and John'".

The book assumes you know Basic, but assumes you know *nothing* about machine code. It starts with well-understood Basic programs. From simple arithmetic and random number generators

Get the most from your Sinclair

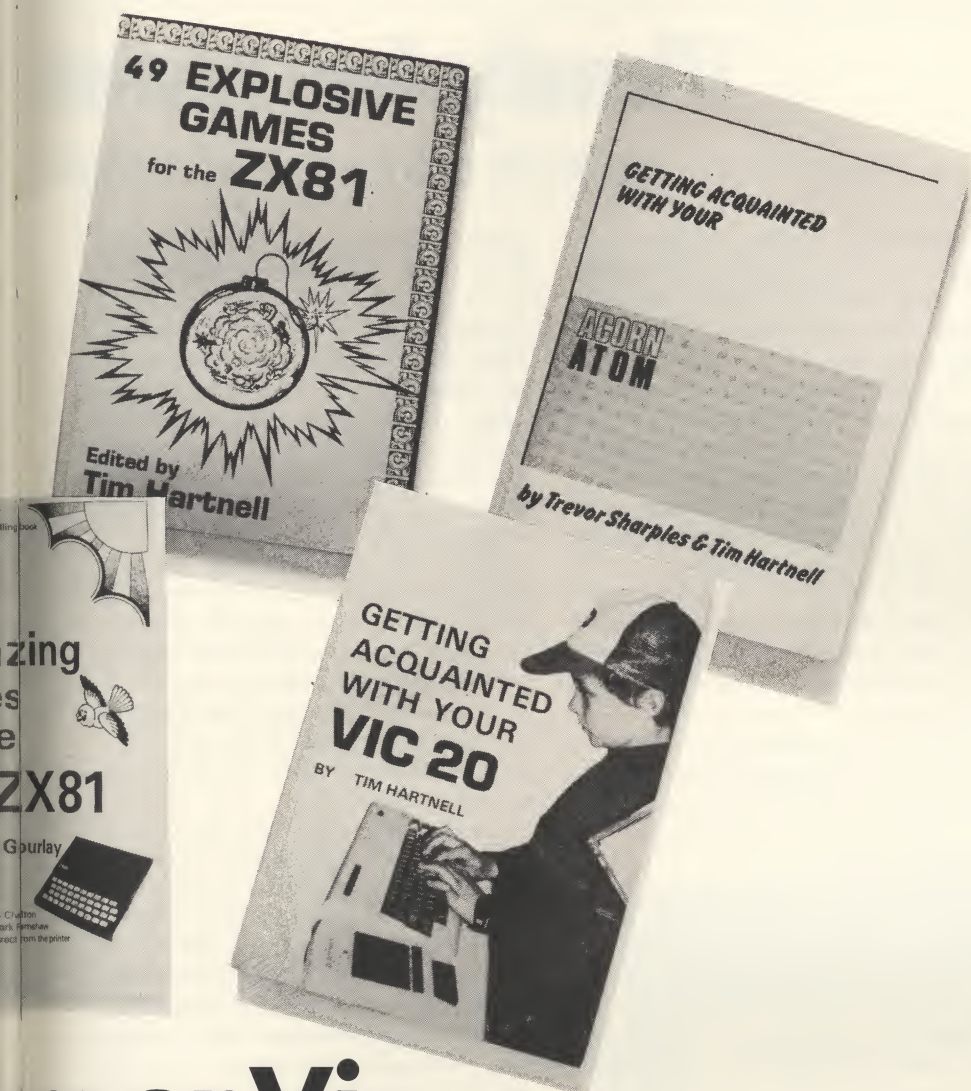


...or Atom

you are guided slowly through a series of easy-to-understand routines. The book includes an intelligent draughts game, with full display, which fits a 1K ZX-81. **Mastering Machine Code on your ZX-81 or ZX-80** by Tony Baker is £7.50, plus 70p p. & p.

34 Amazing Games for the 1K ZX-81—Alastair Gourlay. This book is the answer to the apparently limited 1K memory provided on the standard ZX-81. Alastair Gourlay, a member of the National ZX-80 and ZX-81 Users' Club from Scotland, has spent a great deal of time stretching the 1K to its limits and the result of that work is in this book for you. The programs have all been dumped

Most out of Sinclair...



Acorn or Vic

from the printer and are guaranteed to run first time. The programming tricks Alastair has used to compress the programs can be used by you in your programs. The book is much more than a collection of games. It is a guidebook to show you how to make the most of your 1K ZX-81. **34 Amazing Games for the 1K ZX-81** by Alastair Gourlay is £4.95, plus 70p p. & p.

49 Explosive Games for the ZX-81—plus 27 for the ZX-80— edited by Tim Hartnell. In this book you will find many great games to keep you locked to your ZX-81 for hours. The book has listings for every game we thought you might want, including *Galactic Intruders*, *Breakout*, *Draughts/Checkers*, *Star*

Trek, *Death Maze*, *4-in-a-row* and an 8K *Adventure*-type program, *Smugglers Bold*. As well, there is a

host of new games and adaptations of old favourites.

Many of the programs will run in just 1K, including a simplified *Space Invaders*-type program. Some of the games are based on chance—the dreaded Sinclair random number generator—and others depend on skill, both yours and that of the computer. In editing the book, Tim Hartnell has tried to ensure that each and every program contains at least one programming technique which you will be able to adapt for your programs. **49 Explosive Games for the ZX-81**, edited by Tim Hartnell, is £5.95, plus 70p p. & p.

Getting Acquainted with your Acorn Atom—Trevor Sharples and Tim Hartnell. If the Atom is the first computer you have owned, this 184-page book will help you unlock its secrets. Master the graphics, PEEK and POKE, keyboard scans, Assembler and more. **Getting Acquainted with your Acorn Atom** by Trevor Sharples and Tim Hartnell is £7.95, plus 70p p. & p.

Getting Acquainted with your Vic 20—Tim Hartnell. This 130-page book is based on Tim Hartnell's best-selling ZX-81 books, with extra material on the Vic sound and graphics capabilities. *Computing Today* said: "Tim Hartnell leads the reader, step by simple step, from the absolute basics of programming the Vic to writing complex, sophisticated programs. It thoroughly describes use of the sound, music and colour capabilities and illustrates the use of these functions in over 60 programs and games". **Getting Acquainted with your Vic 20** by Tim Hartnell is £6.95, plus 70p p. & p.

Get the most from your Sinclair—or your Acorn or Vic—by investing in some of the best books available.

ORDER FORM

Please rush me the following books:

Getting Acquainted with your ZX-81 at £5.95	Total
The Gateway Guide to the ZX-81 and ZX-80 at £6.45
Mastering Machine Code on your ZX-81 or ZX-80 at £7.50
34 Amazing Games for the 1K ZX-81 at £4.95
49 Explosive Games for the ZX-81 at £5.95
Getting Acquainted with your Acorn Atom at £7.95
Getting Acquainted with your Vic 20 at £6.95
Add 70p per book for postage and packing
Total

Cheques should be made payable to Interface Publications. Now post order with cheque to Sinclair Books, Sinclair User, 30-31 Islington Green, London, N1 8BJ.

THERE has been no shortage of developments on the hardware side of the market since the introduction of the ZX-81 in March, 1981. Most were based on designs which developed on the ZX-80 and enhanced by the introduction of the ZX-81. The main differences between the ZX-80—even with the 8K ROM—and the ZX-81 are the appearance of a static screen on the ZX-81—slow mode—and the extension to the expansion bus—the edge connector at the back of the ROM CS line which meant that some of the Sinclair address decoding should be sorted-out externally to the ZX-81.

For the first six months or so, firms were very cautious about the ZX-81, watching the market to see whether it would take off. The first product to appear was a sound board, complete with input/output port and a motherboard from Quick-silva; that was one of the first motherboards for the ZX-81 and meant that the user could have more than just the Sinclair 16K RAM pack on the back.

The next announcements appeared in September, 1981 at the Personal Computer World Show—floppy discs, RS232 serial printer port, cheaper input/output ports and, for the first time, the Sinclair printer. Since then things have snowballed; ZX-81 sales have exceeded the 250,000 mark, showing that there is a

great deal of feeling for the micro and the number of firms which have been set up to deal with ZX-81 equipment has more than doubled since September.

The ZX Microfair in November was an event which meant that the equipment which was promised in the glossy advertisements available previously only on mail order could be seen before purchasing. Such was the enthusiasm for that type of Microfair by both the exhibitors—Sinclair alone took more than £8,000 in orders on one day—and the users that another was organised quickly for January.

A word of warning to users—be wary of certain manufacturers who claim that they have a product available when all they are doing is testing the market to see if anyone is interested. It is better to write and confirm on what date they will be able to supply the product to you.

Computer manufacturers have the tendency to quote a date and then supply the product between six and 12 weeks after you have paid. Bigger firms are the main culprits.

I have divided this review of the

Plenty for users t

To lead into in-depth analyses of hardware pr

hardware products available for the ZX-81 into three headings—essential add-ons, keyboards, motherboards and extra RAM. They comprise input and output capabilities where some technical knowledge is assumed; enhancements which require programming skill, but either plug direct into the ZX-81 expansion bus or the ZX-81 is modified by the manufacturer.

There are two leaders in the amount of RAM you can cram into the ZX-81 memory map. The Memotech 48K RAM pack has the largest continuous Basic memory; not all of it can be used for a Basic program—only the bottom 16K (16K-32K). The rest has to be used for storing data but not machine code.

Audio Computing has the largest memory pack available, 128K of RAM but only 32K of it available at any time. To switch between sets of 32K, called banks of memory, a manual switch has to be thrown and the ZX-81 has to be re-set to start up the Basic system again. That is not very convenient, as it cannot yet be operated from software or the variables transferred from bank to bank.

The Memotech 48K was one of the packs I have tested; it was good value at £129 plus VAT, assembled, and is very easy to use.

So the arrival of Memotech's 64K pack must be welcomed, especially as it retails for only £79 including VAT. More about this newly-released product soon.

There are other external RAM packs varying from an extra 3K giving a total of 4K of RAM to a full 16K of RAM cheaper than Sinclair's. Always check that the RAM pack does not prevent you connecting other equipment after it is fitted to the expansion bus. That was the case with the Sinclair RAM pack, which meant that you had to spend at least £10 to attach anything else to the ZX-81. If you are spending that



A cassette recorder developed for the ZX-81.

to choose from

products, Stephen Adams scans the market



money you might as well look at the expansion possibilities after you have it.

The only other RAM extension possible is to change the 1K of RAM chips fitted into the basic ZX-81 for a 2K chip. That necessitates going inside the ZX-81 and perhaps some soldering. After checking inside to see if you have one chip—just change the original chip for the new one—or two—a new-28 pin IC socket needs to be fitted—change one strap on the board. Full instructions usually are given with the kits. The new memory chip will cost at least £7 and RAM packs start at £18.

Various keyboards can be obtained which are basically of the same construction, consisting of 40 professional microswitches mounted on to a bare printed circuit board. That replaces the keyboard on the ZX-81. Usually some soldering has to be done. The new keyboard usually is very light to the touch and extremely responsive, improving the time taken to enter a program by at least 50 percent. None of the original keyboard functions are lost as they are all controlled from software.

There is a wide selection of input/output ports available which can provide from 16 to 24 bits of information on a separate bus to the ZX-81 databus. Those outputs are latched; they keep the data the same while the ZX-81 does other things.

They are the only way of getting information in and out of the ZX-81 to control other equipment. They can be divided into two types, memory-mapped—can be PEEKed and POKEd from a Basic program—and input/output-mapped—using special machine-code routines.

Now various attachments can be used on those ports; A/D converters which take a voltage, measure it and give out a digital number for the ZX-81 to read, D/A converters which

take a digital number and output a voltage corresponding to it. Light pens can be used to draw on the screen by checking the light received against the screen layout at the time. Most of those require some technical knowledge to be able to use them.

Macronics disc system will act like a super-fast tape recorder using specially-written machine core routines. They will be stored in ROM and can be used to SAVE, LOAD and store random data on 5¼in. disc. The maximum is 40K per disc and the cost is expected to be £249. It also includes the only RS232 printer port available; it will accept data only one bit at a time but many printers are available for it.

There are various attachments to

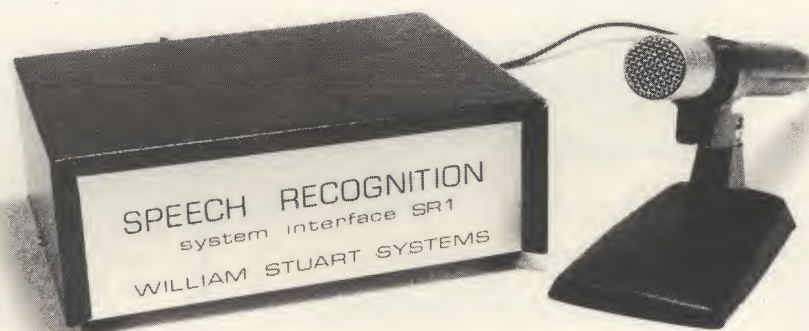
fied, so the resolution can be 512 by 256.

The Sinclair printer uses an aluminium-coated paper with all the characters being shown by black dots. Even without the character board, it can print your own-designed characters but that takes a good deal of memory.

Digital cassette recorders can be bought, designed specially by Monolith for the ZX-81. They are given a registered number and are highly-tuned. If you still want to use your own recorder, Abacus has a cassette switch which will prevent confusion when SAVEing or LOADing.

Motherboards can be plugged easily into the expansion port to give you more sockets, so that all those devices can plug into the ZX-81 all at once.

With all those products it is pleasant to see that one manufacturer, at least, is sufficiently concerned to contact other firms to agree some kind of standard. If you intend to produce something, why



Speech input from William Stuart Systems.

the ZX-81 which, although not essential, can improve the facilities available to the programmer. The newest must be the speech input by William Stuart Systems and the speech output by DCP. That means that you can program the ZX-81 to accept words like LIST, RUN and the like and have it reply in a limited number of words.

Another facility is to have a colour board by Haven Hardware, which is programmable in 16 colours. Programmable character generators can create high-resolution graphics, which can then be printed-out by the very good quality Sinclair printer. Each dot on the screen can be speci-

not speak to Nick Lambert of Quicksilver?

The final enhancement is more of a service than a product. It is called the Buffer Shop and has been set up in London to cater only for the ZX machines. It is the only retail outlet for products, apart from W H Smith, supplying only the Sinclair ZX-81 and 16K RAM pack.

A greater need for any user is more knowledge about what is available. It is only through co-operation of manufacturers with magazines such as *Sinclair User* that the user of a ZX-81 can make a valid judgement. I can only say that I have done my part and now it is up to you.

ZX81 GAMES

FED UP WITH BEING RIPPED OFF?
HAVE YOU BOUGHT
BORING/WORTHLESS/RUBBISH GAMES?
DON'T DESPAIR, TRY THESE!

GAMESTAPE 1, for 1K only £3.95 **KALEIDOSCOPE**
10 games incl. ASTEROIDS, UFO, CODE, BOMBER, GUILLOTINE, KALEIDOSCOPE, etc.
PROBABLY THE BEST VALUE 1K TAPE AVAILABLE!
We've done in 1K, games that some of our competitors required 16K to do!



ARTIST **GAMESTAPE 2, for 16K** only £4.95
*STARFIGHTER... You are fighting at the end of the universe, how many enemy can you destroy? A graphic simulation.
PYRAMID... Can you move the PYRAMID? Make a mistake and it will collapse! A thinkers game.
ARTIST... become an ARTIST, then use the 10 memories to store your drawings. Incl. SAVE, COPY, etc.



GAMESTAPE 3, for 16K only £5.95
*CATACOMBS... A Multi-Level Graphics Adventure. You are alone and lost in the CATACOMBS. How long can you survive? Before you starve to death, or one of the many MONSTERS gets you! Can YOU discover the secrets of the CATACOMBS.



3D MONSTERS MAZE GAMESTAPE 4, for 16K only £5.95
Unbelievable Graphics! Can you find your way through the Maze? The EXIT is there somewhere, but then so is a T. REX and its after YOU! All in 3D, you've never seen anything like this before!



GAMES MARKED * incl. Machine Code
J. K. GREYE SOFTWARE
Dept. SU, 16 PARK STREET, BATH,
Avon BA1 2TE
Trade enquiries welcome

Great Uncle Arbuthnot is Dead

You stand to inherit his entire estate, but first you must prove your financial acumen by turning £10,000 into £100,000 within 26 weeks.

You may invest your cash at the Stock Exchange, on the Metal Market and RISK your capital at the Casino or Races.

WATCH OUT FOR YOUR RELATIVES WHO WILL APPEAR AT THE MOST INOPPORTUNE TIMES; TRYING TO TRICK OR HINDER YOU.

If you are successful you will be able to LOAD part 2 of the game on side 2 of the cassette.

Now enter the world of BIG BUSINESS; you have inherited an ailing soft-drinks factory.

YOUR TASKS ARE SIMPLE:

- Find the secret formula for a potentially world beating drink called PARADISE COLA;
- Manufacture and market the drink successfully;
- Try to predict demand in an ever changing market;
- Cope with STRIKES, FIRES, FRAUDS, etc.;
- Decide on the best time to EXPAND your factory;
- MAKE A MILLION POUNDS.

The game is called "INHERITANCE" and is available on Cassette with full instructions at only £4.25 from:

SIMON W. HESSEL, Dept. S,
15 Lytham Court,
Cardwell Crescent,
Sunninghill, Berkshire.

ZX81

Fast, Efficient Service

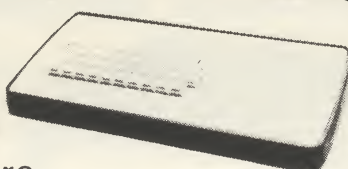
16K RAM

Full Money-back Guarantee

ZX81 owners

Protos

Keyboard is here:



At last! A real, full size keyboard in a top quality case for your ZX-81.

Simply unscrew your ZX-81 printed circuit board from its black Sinclair case and plug into Protos.

FULLY BUILT £64.95 inc. VAT

- More accurate, faster typing with bigger and real keys
- 40 colour coded key-tops for easy reading
- Robust, 'big' computer construction
- PCB prepared for more add-ons to come
- New edge connector provided for Sinclair and other manufacturers' peripherals
- Key legends can be changed for future new ROM functions
- Sinclair PCB fully enclosed — and room for much more

If you feel you've outgrown your ZX-81 don't sell it for peanuts and move to another system. Add it to Protos and make your ZX-81 grow.

For details, large SAE, please. For orders add £2.50 post and packing. Cheques to 'Frome Computing'.

Protos Computer Systems

Frome
Computing,
20 Ashtree
Road, Frome,
Somerset,
BA11 2SF



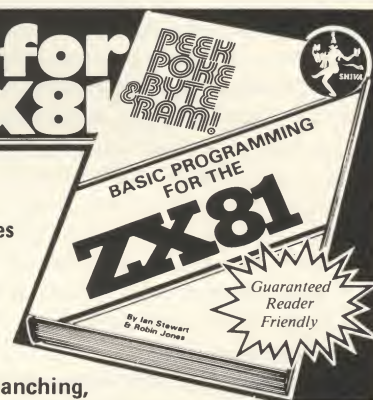
a must for your ZX81

Authors:

Ian Stewart & Robin Jones

The reader-friendly guide
to getting started with
the Sinclair ZX81.

Includes an intro-
duction to looping and branching,
graphics, subroutines, and debugging techniques, with over
50 programs designed to run on the standard 1K memory.



110 pages — Paperback £4.95

ISBN 0 906812 17 8

Published by: Shiva Publishing Ltd. 4, Church Lane,
Nantwich, Cheshire CW5 5RQ. Telephone: (0270) 628272

Order from your bookseller or fill in the coupon

Please supply me with copy/copies of PEEK,POKE,BYTE & RAM. For 1st Class Postage please add 25p

Price: £4.95 per copy. Cheques payable to Shiva Publishing Ltd.

NAME (Capitals please) _____

Full Postal address _____

For payment by Access/American Express

Card No. _____ Signature _____



Write a program and win a super Sinclair printer

Welcome to Sinclair User and the first in a series of competitions which we hope will help you, the user, make more of your machine. For the next five months we will be giving away a printer—and other special prizes—to whoever submits the best programs for the ZX-81. In this first month, as we want to include all the readers with only 1K of memory, the winner will be whoever submits the best original games program.

Fill in the entry form below and while we will accept a cassette it must be accompanied by a well-typed or beautifully hand-written listing. Your entry must reach us by April 10.

As a tie-break—if one is necessary—we want you to write a slogan beginning with the words: 'My ZX-81 helps me'. The usual rules, about the editor's decision being final and employees of ECC Publications being ineligible, apply.

ENTRY FORM

Complete this slogan which will be used as a tie-break: 'My ZX-81 helps me.....'

Name

Address

Send your entries to ECC Publications, 30-31 Islington Green, London N1 8BJ to arrive not later than April 10.



Learn all about computers through a remarkable new language.

Simple English.

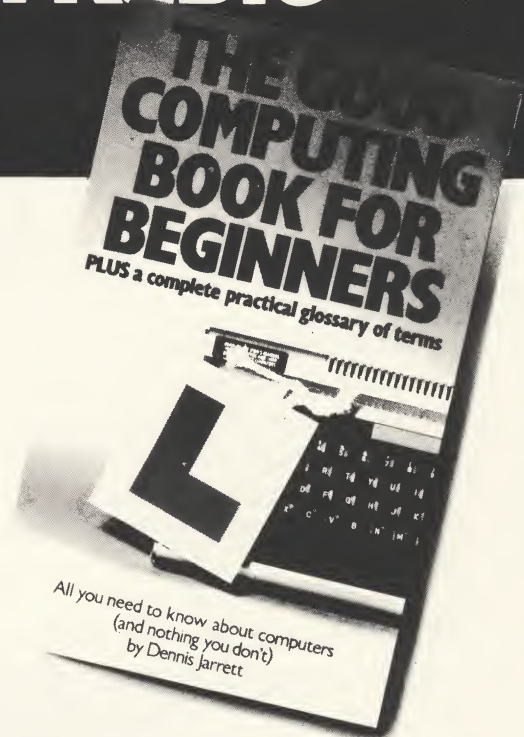
At long last, someone has written a book on computers that even Aunt Emily can understand.

That someone is none other than Dennis Jarrett: doyen of simple English and former Managing Editor of *WHICH COMPUTER?* and *Practical Computing*. And his book is called *The Good Computing Book for Beginners*.

If you're not a beginner, don't let the title put you off. Because this book provides a wonderful opportunity of clearing up any grey areas of your knowledge.

And a glance at the chapter headings down below may well give the impression that this book is fun to read. You would be right. It's the brightest way imaginable of learning all about computers.

There's also a complete language guide to



computer-jargon mumbo-jumbo in a glossary of terms that's as comprehensive as you'll find anywhere.

All in all, you'll find this book does for computers what Berlitz did for languages. In 304 pages. And at a modest £1.95.

Your course in computers.

- 1** Introduction to the introduction – computer myths, why they are being dispelled, and the truth about computers.
- 2** What goes on inside – a swift canter through the heavy technology, avoiding irrelevant and/or difficult ideas: processors, chips, memory, I/O.
- 3** Programmes – what makes the computer tick, or at least where the noise comes from: system software, applications, the pleasant and unpleasant faces of programming.
- 4** What's a personal computer? – new readers start here, because this is all you need to know: what can it do? What's available? And where do you buy a computer?
- 5** What to look for – how to buy a small computer, or at least how to avoid complete disappointment.
- 6** A practical glossary – facts, opinions, references and a few personalities.
- 7** Now read on – recommended reading, with notes.

Enrol here!

Please send me ____ copy(ies) of the Good Computing Book for Beginners at £1.95 each plus 50p for postage and packing.

☐ I enclose cheque for £ ____ made payable to ECC Publications.

Name _____

Address _____

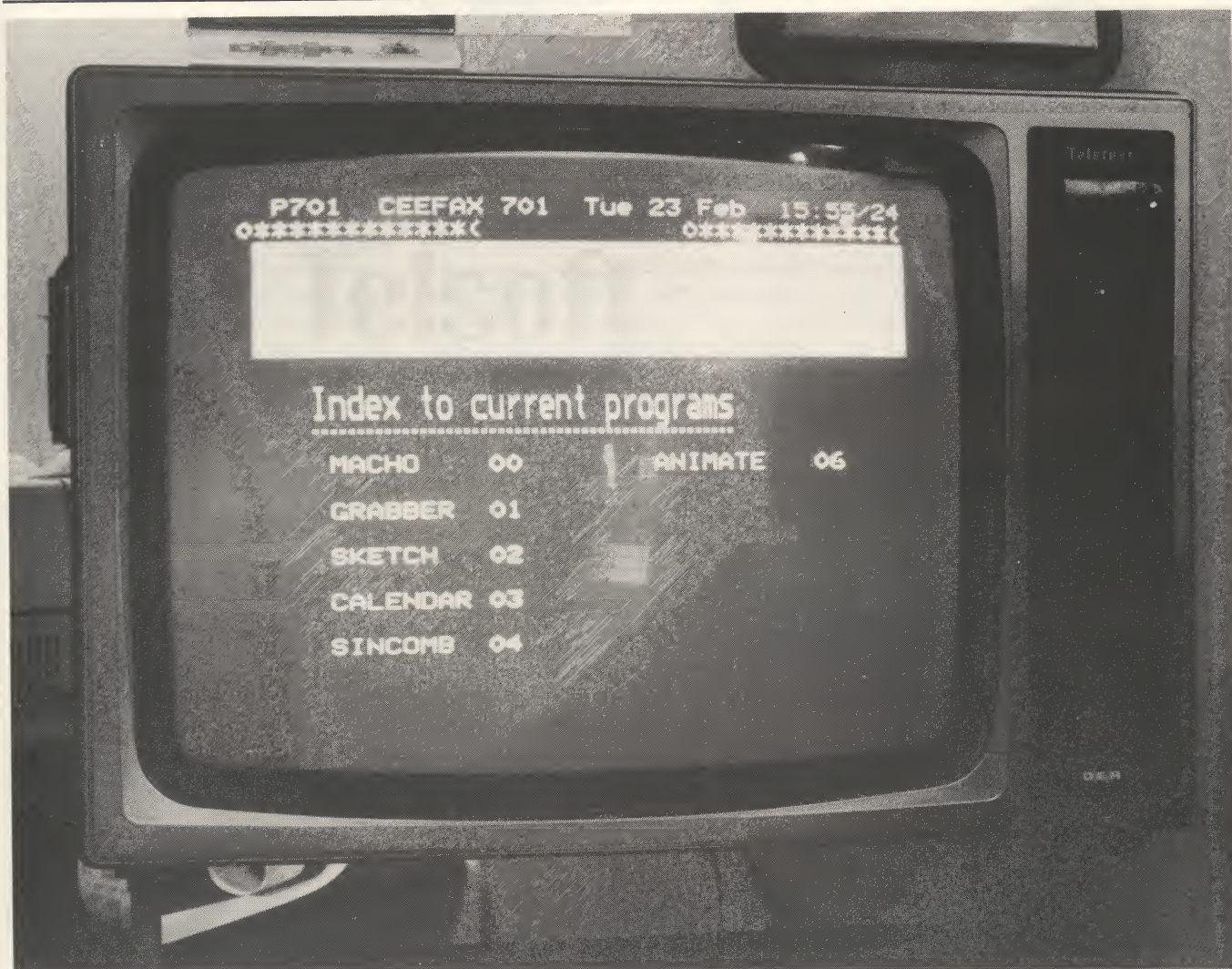
☐ Please charge my credit card the sum of £ _____

Name of credit card _____

Number _____

Signed _____

Now post please to ECC Publications,
30-31 Islington Green, London N1 8BJ.
Telephone enquiries: 01-359 7481.



April debut planned for prize-winning adaptor

There are more than 20 entries for the £1,000 first prize which goes to the designer of best ZX-81/Prestel adaptor. Roger Green tells the story and why there is a need for the adaptor.

A BRITISH Telecom-endorsed adaptor to allow ZX-81s to run telesoftware programs transmitted by viewdata is to be unveiled at the end of April. The design of the £50 add-on gadget will be the winner of a competition launched at the end of 1981 by Tele-

com to boost interest among Sinclair users in programs delivered by telephone line through the Prestel viewdata service.

The adaptor is scheduled to make its debut at the April 23-25 Computer Fair in London.

More than 20 competing designs

for the unit—which “should be in the spirit of the ZX-81, low-price, practical, robust and efficient”—were entered by the March 14 closing date.

(continued on page 62)





(continued from page 61)

Do not expect, however, to be able to look at Prestel information pages if you buy the adaptor. British Telecom telesoftware product manager Tony Sweet expected that the television display circuitry for that would have to be omitted to keep down costs. He explained:

"What is required is a cheap device which will allow the ZX-81 to load and execute programs stored on the Prestel database".

Viewdata was devised 10 years ago as an inexpensive method of selling to the public information stored at dedicated Telecom computer centres. Users dial the computer from a television set, either with built-in additional circuitry or linked to a special adaptor, and select the information they require by pressing buttons on a calculator-like keypad.

The original idea was to gene-

rate out-of-office-hours telephone traffic. As such, the service has so far flopped, so now Telecom is seeking new ways to stimulate demand for Prestel. One way is distributing telesoftware programs to owners of personal computers.

The idea of delivering programs in that way is not new in the mainstream computer world. Personal computer users in the U.S. have for some years enjoyed down-loaded programs obtained from special computer services.

The information transmitted by a Prestel computer is a series of 10-bit binary codes—a start bit, seven data bits, an even parity bit and a stop bit. The viewdata decoder strips-out the data bits which can represent one of 128 display or control characters for the television screen. The display characters include all the usual alphanumeric, some special symbols, and a series of shapes

which are used to construct the crude graphics which have become the Prestel trademark.

The display area is treated as 24 rows of 40 character positions. The control codes are used to add attributes to the displayed characters, such as background colour or flashing.

In telesoftware, each seven-bit code can be used to represent an instruction of a microcomputer program. A telesoftware adaptor incorporates some buffer memory and a control program to transform them into executable code which will run when loaded into the ZX-81 RAM. In theory, the transformations could be handled by the ZX-81 but in practice that would take too much memory.

The trickiest problem in the design of the adaptor is likely to be the construction of the modem/line termination unit which links the

(continued on page 63)

MICRO GEN QUALITY PRODUCTS

ZX81 A/D CONVERTER BOARD

This 4 channel analogue to digital converter, originally developed for joystick control, can be used for such applications as measurement of voltage, temperature, light intensity etc.

The board fits in between the RAM pack and the ZX81. (No skill is required to make this connection, and it actually improves the stability of the RAM pack.)

Price now only £18.50

JOYSTICKS FOR THE ZX81, only £9.50 each

- * The most exciting add-on ever for the ZX81, free yourself of that dead, unresponsive keyboard.

- * 1 or 2 joysticks may be connected via our A/D board.

- * Turns your ZX81 into a true programmable games machine.

- * Extends the capability of the ZX81, imagine the tremendous variety of games and applications that now become possible.

- * Details supplied on how to use the joysticks in your own programs.

Please note that you cannot connect conventional analogue joysticks directly to the digital input ports found on most I/O boards, an A/B convertor such as ours is required.

A free copy of ZX AMAZE plus any one of the games listed below when ordering a Joystick and an A/D board.

Programs available

ZX SPACE INVADERS You've tried the rest, now try the BEST.

This program has many features including an ever increasing rate of play, (they'll get you in the end).

only £3.95

ZX BREAKOUT Quite simply the best breakout on the market.

Features seven bat angles, (you won't find this one easy).

now only £3.95

ZX NEW YORK A very addictive arcade game.

Bomb and shoot you way out of trouble, otherwise you are doomed to crash. Generates a different pattern, for a different game each time you play. On the reverse of the cassette is ZX REFLEX, find out how fast you really are.

now only £3.95

ZX CHESS The original and still the best. * Graphic display of chessboard. * 6 levels of play. * Displays record of your moves and the computers. * Board can be set up to any position. * Has ability to change sides or level in mid-game. * PLUS * CHESS CLOCK on reverse side, records time taken by each player. * Resetable function. * Single key entry.

now only £6.50

All our games are written in machine code, and can be used with joysticks or keyboard, (except chess, keyboard only). Supplied on cassette with library case.

Too allow you to prove to yourself that our products are second to none, MICRO GEN offers the following terms to our customers.

14 DAYS FREE APPROVAL ON ALL PRODUCTS

All money will be refunded if goods are returned in good condition within 14 days of despatch.

If you write a program which is exceptional, please submit it to us. We will offer a royalty if it is suitable. Cheques and PO's payable to MICRO GEN, Dept. SU 1, 24 Agar Crescent, Bracknell, Berks.

(continued from page 62)

device to the telephone network. A viewdata modem employs asymmetric transmission format—1,200 bits per second from computer to terminal, 75 bits per second for the human button-pushing in the other direction.

The interface with the telephone line will have to be built to rigorous standards of electrical safety to meet the notoriously-strict Telecom rules.

Telesoftware began with some research by the Independent Television Companies Association as part of its Oracle teletext activities.

Teletext is a close relation of viewdata. Information is delivered to modified television sets in the same format as in viewdata but scrambled into television broadcast signals instead of by telephone lines.

Because there is only so much spare capacity in the television signals, there is a limit of a few hundred to the number of screens of information which can be delivered by a teletext data store. That limitation is the key difference between teletext and viewdata.

The term telesoftware was coined by a consultant, Will Overington, who had the idea of broadcast "software at a distance" in 1976.

The first telesoftware program was transmitted by the Oracle teletext service in February, 1977, for reception on a specially lashed-up Signetics microcomputer system.

The experiments continued later that year with other simple programs, a version of the ubiquitous *Mastermind* game and a calculate-your-repayments mortgage routine.

In parallel, the early demonstrations of what became the Prestel viewdata service included showing some programs initiated from user terminals. Those, too, allowed the calculation of mortgage repayments.

Those early efforts, however, depended on the the viewdata computer doing the work, with only rudimentary data submitted from the dumb terminals.

Although the data processing feature was much talked about in the early days of Prestel, it was dropped quietly as the system was brought

Telsoft

into regular service, because it tied up too much computer power.

By May, 1978, however, the idea was gaining ground of telesoftware transmissions by viewdata to intelligent user terminals. The chairman of CAP, a major British computer programming company, predicted confidently that viewdata would become a major vehicle for software distribution.

It seemed then that teletext telesoftware—because it was free to anyone who had the proper equipment—would emerge as the major medium for programs delivered to domestic users. Commercial data processing users, on the other hand, would buy their programs from a viewdata service which was able to charge them for it.

CAP subsequently put some of its own and £90,000 of Government money into developing the concept. In November, 1978, the company had a full-page advertisement in *The Times* to inform a wider world about the innovation and to ask: "Has British management the will to exploit it?"

Evidently British management did not. Outside the world of viewdata research, it seemed that no-one wanted to be told about telesoftware.

The following year, public interest was minimal when, in May, telesoftware emerged as part of the ambitious plans of the then Labour Government to educate the nation.

Telesoftware was touted as a method of training the unemployed, through intelligent viewdata sets, to design microcomputers and 64K memory chips.

The initiative disappeared as CAP fell into financial difficulties and decided to stay with more bread-and-butter business activities.

At the end of 1979, another attempt

was made to promote the cause of teletext telesoftware when the results were revealed of a collaboration between the Oracle engineers and Mullard, the Dutch-owned electronics manufacturer responsible for most of the world's production of the special chips used in teletext and viewdata decoders.

A prototype intelligent television set was demonstrated running telesoftware programs. As usual, there was one to calculate mortgage repayments and the initiative returned to obscurity.

During all that time, a top-level committee, representing all the interested parties, had been deliberating on the design of an intelligent viewdata terminal. All that emerged, however, was disagreement about the version of computer language in which telesoftware should be written.

The most positive and most promising development in viewdata telesoftware occurred in September, 1980 when the Council for Educational Technology published a recommended format for telesoftware programs stored on Prestel.

The move by British Telecom to initiate the development of a ZX-81 adaptor is in parallel with its other attempts to enlist the help of personal computer enthusiasts to bootstrap the telesoftware concept.

The winning adaptor is to be awarded a £1,000 prize and the possibly more generous carrot of freedom to sell the design to the 250,000 other Sinclair U.K. users.

If only a tiny proportion of ZX-81 owners signed for Prestel, it would make a big increase to the number of users. At present it is no more than 15,000, at least one order of magnitude below the estimates made in the optimistic days of the late 1970s.

SINCLAIR USER

- the best enhancement yet for the ZX enthusiast.

Make sure you get it monthly!



What is the best way to guarantee that you never become bored with your Sinclair computer?

The answer is to subscribe to Sinclair User ... written specifically for owners of ZX 80's and ZX 81's. Sinclair User is the latest monthly from ECC Publications - pioneers of Practical Computing, WHICH COMPUTER?, and Computer & Video Games. Whether you bought your system yesterday or are an old hand, you are probably an enthusiast for your machine. And your biggest problem is likely to be obtaining all the information to satisfy your interest. We promise that Sinclair User will be devoted entirely to quenching your thirst for information.

As the name suggests, the content will be geared specifically to helping you, the user. There will be pages of information on available hardware and software. Our expert writers will analyse established products to help

you make the right choice. There will be exclusive pre-release snippets on products which are about to hit the market. Our aim is to make Sinclair User invaluable and we will chronicle applications which are of special interest.

Each month we will carry pages of programs. Another must for every user is our first-rate helpline service. And we intend to carry as much information as possible about clubs. Last but not least let us say that the best way you can guarantee you like the magazine is by participating yourself. Don't forget to ask us your queries; send in your programs - for which we will pay £10 if we publish - and be sure to tell us if you are using your ZX 81 in a special way. Send in your club news and tell us of any interesting people out there in userland. And just in case you need further convincing, look at our forthcoming editorial plans.

Can you continue to get the most out of your ZX without reading the Sinclair User every month? So why not fill in the subscription order form **today?**

Editorial Plans

May

The Sinclair 16K RAM dissected,
Adventure games programs

June

Disks - a look into the future
Graphics software

July

The ZX81 memory map analysed
Debugging programs

August

The Sinclair printer and its alternatives
Chess programs

September

Enhancements for the enthusiast (e.g. colour, sound, high resolution, speech)
Business software for the ZX81

sinclair user

ECC PUBLICATIONS
30/31 ISLINGTON GREEN LONDON N1 8BJ

Subscription Order Form

I wish to start a subscription to Sinclair User. I understand that I may cancel my subscription at any time and you will refund the balance.

☐ I enclose a cheque for £9 for 12 issues (UK only - including postage)

☐ Please charge my credit card.

Card Name _____ No. _____
Name _____ Address _____
Signed _____ Date _____

Cheques should be made payable to ECC Publications.

Overseas rates: Europe £18, Outside Europe £24 (including air-mail postage)

THERE are now many versions of chess for the ZX-81, which proves how popular the game was. I do not intend to review those versions as that would be unfair, because I wrote a ZX-80 version, but I would like you to send any games you have played with those versions, noting your likes and dislikes. We can compare the versions and see what, if anything, is wrong.

We shall probably notice that the same type of problem appears with all the versions. I can then explain why those problems might exist and you could then reply with your comments.

It is known that a computer cannot play the end game very well; the dedicated chess computers on the market have shown that to be true. I have played against *Chess Challenger* and that shows how well it can play at the start. The production of good openings, by storing standard moves, is a common practice.

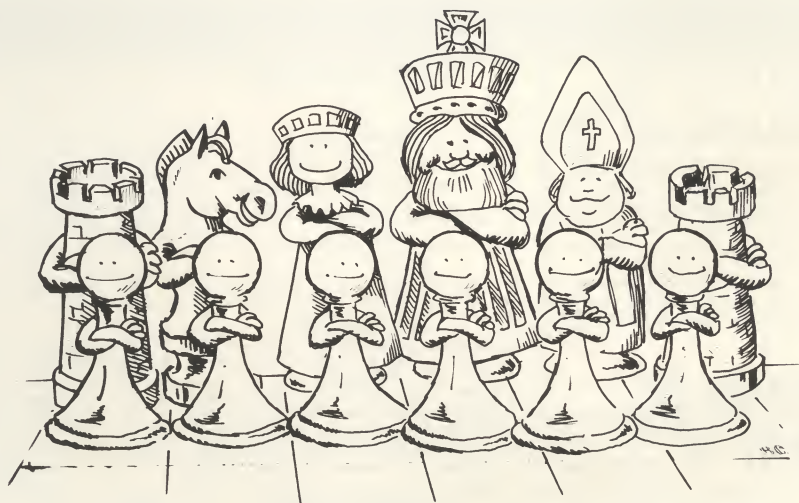
Even at the middle game, it shows large amounts of skill. As the game draws to a close, however, the dramatic decrease in skill is noted. The reason is clear; the number of ways in which a game can end makes it very difficult to put standard moves for it into the computer.

If you had a large mainframe computer with its large amount of storage, you could begin to investigate the end game. That has little to do with the dedicated chess machine and even less to do with the ZX-81 but it shows that it is all a matter of storage space.

In a 16K ZX-81 the standard of play is a reflection of the program. The speed of the compactness of program will change only in real terms when you move from Basic to machine code.

The standard of play therefore, I feel, is changed only by how compact the program is. A strong game is a reflection of how compact and therefore how well-written it was. The market for the ZX-81 versions is strong and I would imagine new or updated versions will follow thick and fast.

Keeping in mind what I have said,



It's the program that matters if you want the satisfaction of a good game of chess

Philip Joy, who it is generally acknowledged wrote the first worthwhile ZX-80 chess program, begins a series of articles on that game and the many others which stimulate the brain as well as being of immense fun

will an update be so much better? If so, think what must have been done to make it better. If you have one of those updates and you have the old copy, send your views on the update compared to the old version and say whether you think the update is much better than the old one.

In future issues I shall include some of the best letters concerning what I have asked and I will answer them with some reasons why things are as they are. Of course, I hope that some of you are thinking of starting, or are even halfway through your own chess program. You may be interested only in the middle game, or how to obtain the best graphical board; if so, send them. I shall be pro-

viding from time to time hints and perhaps portions of my programs.

By what I have asked you to send, we should be able to know everything about the version on the market. I shall hope to include portions of any routines you send, including my own, to provide a set of routines, which may, in the end, produce a chess program.

If that happens, we will all have a chess program built by you, the readers. In the end this page will become a watchdog for chess programs and a library of routines, which I hope could be turned into a working program and printed.

Chess Challenger is copyright by Fidelity Electronics.

Sinclair Supermart

Maths Education ^{ZX81/1K}

At last! Tasty maths tasks. Challenging but do-able. **Cassette of 1K programs: RATIO, FUNCTIONS, TABLES, FRACTIONS, ESTIMATES.** Each at two levels, plus MEMORY, SENTENCES. Devised by a professional maths educator for ages 9-16. Cassette for only £3.25 from **Math-Ed, 20 Wandle Road, London SW17.**

Math-Ed

ZX81-1K starter pack

Twelve programs on cassette written for the new user to demonstrate the versatility of the ZX81. Seven exciting moving graphic games including, Invaders, Tank-Shoot, Subsearch and Road Race: A sound generation program is also included.

Orders despatched on high quality cassette by return, £3.90 with order to:

Second Foundation

22 Bramer, Belgrave
Tamworth, Staffs. B77 2LL

MICROWARE

Retail shop in
LEICESTER
Hardware, Software,
Books, Monitors etc.
For ZX81

131, MELTON ROAD,
LEICESTER

ZX81 USERS

Fighter Pilot - You are the pilot of a jet fighter. Test your instrument-flying skills from take-off to landing with this real-time, 3-dimensional flight simulation. Supplied on cassette for 16K ZX81. **£3.45.**

C12 Cassettes - £4.99 for 10
Motherboard - Two-slot motherboard for expanding your ZX81. Complete with 5v. regulator to remove the strain that hardware extensions put on the internal regulator. Only **£14.95** built and tested.

23Way ZX Edge Connector
-£3.49 each

Exciting new hardware and software products in development.
ALL PRICES INCLUSIVE

Digital Integration, 22 Ash Church Rd.,
Ash, Aldershot, Hants. GU12 6LX.
Mail Order Only

ZX81 EDUCATIONAL CASSETTES
good quality: popular with children, parents and teachers.

16K GEOGRAPHY. Find towns in U.K. or Europe with a series of five maps drawn on the screen. Plus Town and Country naming program and English Towns Hangman.

16K LEARNING FUN. Add in words, work out areas and perimeters, translate French, English Vocabulary Test plus two versions of Hangman.

16K ART AND FUN. Play Noughts and Crosses, Battleships or Board Game. Draw a picture, record it to display again, even print it. Plus fascinating Pattern Generators.

£3.95 each post free from:

**A. Parsons, Dept S,
23 Coxhill Gardens, River,
Dover, Kent.**

ZX81 (16K) EDUCATIONAL SOFTWARE

G.C.E. "O" LEVEL MATHS: 3 full 16K programs ranging over whole syllabus.

JUNIOR MATHS 1: Long Mult, Long Div, HCF, LCM, Fractions 1 (+ & -), Fractions 2 (x & ÷).

JUNIOR MATHS 2: Areas, Perimeters, Simple Equations, Percentages, Sets, Venn Diagrams.

JUNIOR ENGLISH 1: Meanings 1, Meanings 2 (harder), Parts of Speech, Proverbs, Similes, Anagrams.

JUNIOR ENGLISH 2: Idioms, Opposites 1, Opposites 2 (harder), Group Terms, Odd Word Out, Spellings.

£4.50 per cassette or send sae for catalogue to:-

**ROSE CASSETTES, 148 Widney Lane,
Solihull, West Midlands B91 3LH.**

ZX81 Quality Software

GALAXY INVADERS (needs min 4K RAM) cassette and instructions £3.00

MULTIGRAPHICS 2.3 (needs 16K RAM) cassette and 20 page illustrated Manual. £4.50

1K GRAPHICS (4 programs) cassette and instructions £3.00

1K GAMES (5 games) cassette and instructions £3.00

1K STATISTICS (4 programs) cassette and instructions £3.00

16K RAM only £37

with FREE "GALAXY INVADERS" cassette

** Send s.a.e. for details **

Prices includes VAT. Post and packing

FREE in British Isles

BRIDGE SOFTWARE (U),

36 Fernwood, Marple Bridge,

STOCKPORT, Cheshire SK6 5BE

* Mail Order Only *

ZX81 FORTUNE TELLER

is exceptional value for money. Our 40-page book includes:

Tarot Cards * I Ching

The 52 Cards * ESP Tests

Biorythms * Numerology

Ouija Invaders * Mandala

10 major, bug-free, programs are presented with drawings, diagrams, charts and over 2,500 words of explanatory text. An appendix contains 8 machine-code subroutines, totalling over 2 1/4 kilobytes and printed in friendly decimal.

Each program fits into 1K, but the more RAM the better—free expansion details on request.

Why pay £4 for a run-of-the-mill tape?

Fortune Teller is different, and only

£2.50—1st class post free—from:

Filesoft, 114 Harris Street,

St. Helens WA10 2NP

Sell your used computer or peripherals through Sinclair Supermart at low cost... up to 30 words for only £5.

Have you updated your computer or do you no longer use that add-on? Instead of leaving it lying around, turn it into cash by placing a classified advertisement in Sinclair Supermart and reach around 40,000 users of the Sinclair ZX systems. Please write your advertisement in the boxes below, one word per box. Underline words required in bold type. Your name, address and/or telephone number should be included *Please print in block capitals.*

Note—this service is open only to private advertisers. The advertisement will appear in the earliest possible issue.

Name:

Address:

..... Tel:

Have you included the fee of £5?

Conditions

The Advertisement Manager reserves the right to alter, reject or suspend an advertisement without assigning any reason. Advertisements are accepted subject to approval of copy and to the right of the Advertisement Manager to alter, reject or cancel any order without explanation. The Proprietors are not liable for any loss from any cause whatever, nor do they accept liability for printers' errors. The Advertisers shall indemnify the Publishers in respect of any claim, cost and expenses arising out of any libellous or malicious matter or untrue statement in any advertisement published for the advertisers, or any infringement of copyright, patent or design therein. The placing of any order will be deemed to be an acceptance of these conditions.

ALGOR 16K ZX81 and ZX80/8K ROM PROGRAMS ON CASSETTE

16K81/1 - £3.30. MINES & MONSTERS: A narrative adventure game for 1 to 4 players.

STOCKMARKET: (1 to 4 players) Make your fortune buying and selling shares.

16K81/2 - £3.50. SHELOB'S LAIR: The pictorial adventure game with complete room structure. You can choose your weapons for battling with the denizens of the lair.

ECONOMY GAME: (1 to 4 players) Can you set the economy to rights and out-persuade your opponents to win the next General election? You may lie a little.

16K81/4 - £3.50. CHEOPS' TOMB: (1 to 4 players) Adventure with complete room structure which draws the room the player is in. Can you get by the old Gods to the sarcophagus and thus find the only means to escape?

COMMODITY GAME: (1 to 4 players) Bid for contracts of supply against your opponents. Buy materials on the market at a bargain and sell for massive profit.

16K81/X - £5.50. COMPILATION: MINES & MONSTERS, ECONOMY GAME, STOCKMARKET, COMMODITIES GAME.

Cheque or P/O to **Algor, Dovercourt, St James' Rd., Northampton.**

Price list on request. Post and Pack is included. Overseas add £2.



ZX-81

PACK 16/1 includes all of:

AIR TRAFFIC CONTROL: Animated radar screen of busy airport shown, you must bring planes into land; INVADERS SELF PLAY; PHONEBOOK – keep friends' and relatives' numbers on cassette; DATE '81 – computer dating program. Who will it pick for you?

ALL ONLY £4.95

PACK 16/2 includes all of:

ADVENTURE ATLANTIC: You may become very rich or you may be marooned forever; BREAKOUT; SQUASH PRACTICE; LANGUAGE TRANSLATOR translates any European language to any other; COMPUTAPRINT – use this program to predict results of horse races, football pools, etc.

ALL ONLY £4.95

CASSETTE 1½

A super value cassette of 16K and 1K software written in Machine Code and Basic.

Includes:

React, Invaders, Phantom Aliens, Maze of Death, Planetlander, I Ching, Hangman, Invaders, Laser Base, rectangle plus more.

ALL ONLY £4.95

PACK 16/3 includes all of:

INDI 500; video road racer; DRAUGHTS; Computer Chequers; BATTLESHIPS – nautical warfare on your own computer.

MASTERMIND – Brain teaser, see if you can beat a microelectronic mind.

ALL ONLY £4.95

The breakthrough you've waited for:

PROGRAM THE ZX81 IN ENGLISH!!!

With GAMAL 81 you can now write adventure programs in hours not weeks and with GAMAL 81 you'll have every adventure you'll ever want for the price of one.

Comes on cassette with instruction book, £7.95

Tapebook 50, Version 3

50 programs for the 1K RAM ZX81.

Latest version includes:

SQUASH, BREAKOUT, COLUMBIA, SPLAT, INTEGRATION, CREDIT CARD CALCULATOR, BANK A/C, VATCHECK, TANK BATTLE, TORPEDO, HEXLOADER, BINARY CONVERTER, AND LOTS, LOTS MORE.

Still amazing value at £6.95 the lot.

ZX AUTOCODER

This program takes your BASIC, converts it into Z80 assembly language. ZX AUTOCODER compiles a subset of **ZX81** BASIC for the following: PRINT, PRINTAT, PLOT, CLS, PAUSE, GOTO, GOSUB, IF THEN, GOTO, and LET statements.

£6.95 including Cassette and Manual

ZX BUSINESS SYSTEM

This is our latest package which includes all the software you need to use a **ZX81** in a small business. We bring you a full feature system only found on much larger computers. This includes:

PURCHASE LEDGER

SALES LEDGER

STOCK CONTROL

MAILING LIST

PHONE DIRECTORY

ALL THESE ARE SUPPLIED WITH CASSETTES AND MANUALS
INTRODUCTORY PRICE £14.95

YOU WILL NEED 16K RAM ALTHOUGH A PRINTER IS OPTIONAL

PACK 16/1 + 16/2 + 16/3

(any two only £5.95)

ALL THREE ONLY

£6.95

TAPEBOOK 50.3 + CASSETTE 1½

BOTH ONLY

£9.95

All prices include VAT and postage and packing

CONTROL TECHNOLOGY,
39 Gloucester Road, Gee Cross,
Hyde, Cheshire SK14 5JG
061-368 7558

OVER ¼ MILLION PROGRAMS SOLD TO DATE!

KEYBOARD £25.70

**EX
STOCK!**

No soldering - just plug in
Proper switches
Two colour legends
RAM/PRINTER operation not affected

KIT £20.50

CASE 10.30

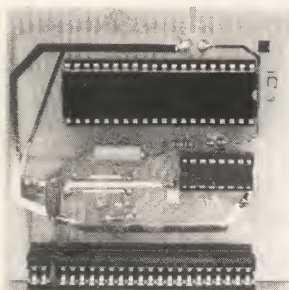
EXTRA KEYS

48 P



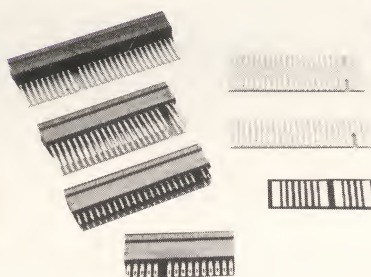
MUSIC BOARD

3 channels
Kit £16.95
Built £18.95



IN OUT PORT

24 Lines(in or out)
Controlled by basic
Built £16.95
Kit £18.95



CONNECTORS

23 Way female	£2.95
23 Way male	1.30
30 way ribbon	1.40

BOOKS



Getting acquainted	4.95
Mastering machine code	5.95
Programming for real applications	6.95
Tape for above	11.44

REDDITCH ELECTRONICS

DEPT SU
21 FERNEY HILL AVENUE
REDDITCH
WORCS B97 4RU
ENGLAND

TEL 0527 61240

Send SAE for free illustrated catalogue (5" x 7")
All prices include VAT and postage.
Orders under £10 add 40p.
Overseas add £1.80

